FISHERY RESEARCH

KOOTENAI RIVER FISHERIES RECOVERY INVESTIGATIONS: ECOSYSTEM REHABILITATION

ANNUAL PROGRESS REPORT
April 1, 2002—March 31, 2003

Prepared by:

Ryan S. Hardy
Fishery Research Biologist

IDFG Report Number 04-01
December 2003

KOOTENAI RIVER FISHERIES RECOVERY INVESTIGATIONS: ECOSYSTEM REHABILITATION

Project Progress Report

2002 Annual Report

By

Ryan S. Hardy

Idaho Department of Fish and Game
600 South Walnut Street
P.O. Box 25
Boise, ID 83707

To

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-3621

Project Number 1988-06500
Contract Number 00004691

IDFG Report Number 04-01
December 2003

TABLE OF CONTENTS

Page

LIST OF TABLES

List of Tables, continued.

LIST OF FIGURES

List of Figures, continued.

Page

LIST OF APPENDICES

ABSTRACT

Establishing a baseline for selected levels of the Kootenai River food web was a research objective for the 2002 Ecosystem Rehabilitation Study. These 'baseline' data will add to a database to document trends in the fish community and zooplankton composition and abundance over time and will be used as "pretreatment" data for the proposed nutrient enhancement of the Idaho section of the Kootenai River. In September of 2002, five previously established biomonitoring sites were electrofished to identify relative species abundance as catch per unit of effort (CPUE), abundance by weight as biomass per unit of effort (BPUE), relative weight (Wr) and condition (K), and trophic structure. Microinvertebrates (zooplankton) were sampled at three previously established biomonitoring sites from June through the end of the year, with collections once each month from the left, center, and right channel. Fish were collected using boat mounted electrofishing equipment in September at five different locations. A total of 14 fish species were identified; sampling effort ranged from 2,599 to 6,017 seconds per site. Total catch per unit of effort (over all species) was highest (383 fish/h) in the braided reach of the upper river sections, yet biomass per unit of effort was highest at rkm 265 (59 kg/h; upper canyon reach). Largescale sucker *Catostomus macrocheilus* were ubiquitous and exhibited one of the highest catch rates and biomass throughout all study reaches. Additionally, mountain whitefish *Prosopium williamsoni* were abundant in upstream locations, while northern pikeminnow *Ptychocheilus oregonensis*, peamouth chub *Mylocheilus caurinus*, and redside shiners *Richardsonius balteatus* were more abundant in downstream locations. Trout and other sportfishes were found in low abundances. Overall, there was a shift from high proportions of sensitive and intermediate species (with respect to human disturbance) in the upper river sections to more tolerant species in the lower river sections. Relative weights and condition factor generally declined in all fish species from upstream to downstream except for largescale suckers. Zooplankton were collected by filtering 10 L of water through a 1 L straining cup lined with a 63 µm mesh filter material monthly from June through December at three different locations. Densities of macrozooplankton were dominated in proportion by copepods (predominantly *Naplii*). Microzooplankton (rotifer) species peaked in August at approximately 250/L and tapered off to 20/L in November. Rotifer species were predominately *Keratella cochlearis* and *Polyarthra remata*. It is presumed that much of the microzooplankton densities are directly linked to entrainment from Lake Koocanusa located 76 km upstream of the Idaho/Montana border.

An additional objective for the 2002 study was to determine angler harvest pressure and catch rates by continuing a previously established random stratified creel survey on the Kootenai River from Deep Creek upstream to the Idaho/Montana border. Total estimated sportfishing effort in the 2002-2003 creel (13,815 hours [±1,965] at the end of the season) was down 59% from 2001-2002. It is believed that the reduction in effort is primarily attributed to above average flows from spring runoff, keeping most anglers off the river until late July and early August of 2002. Catch rates have increased for mountain whitefish and substantially for rainbow trout since 1993. With downward trends in the densities of these two species over the past two decades, it is speculated that a change in angler demographics towards more successful anglers may be the cause. Due to the nature of the information collected, it is believed that any efforts to restore river productivity would benefit all levels of the food web. Such increases in river productivity may subsequently increase angler catch rates and the overall fishing experience in the Kootenai River.

Author:

Ryan S. Hardy
Fishery Research Biologist

INTRODUCTION

The Kootenai River ecosystem has been subject to many anthropogenic activities for the past century. Extensive agriculture, mining, and land use practices since the 1920s have taken their toll on the river ecosystem (Northcote 1973). From the mid 1930s through the 1950s, the construction of dikes on the lower Kootenai River to prevent valley flooding cut off the river's historical flood plain habitat. In this lower river section, the lack of access to the flood plain and a limited riparian zone translates into low importation of allochthonous carbon materials to drive trophic interactions (Snyder and Minshall 1996).

The availability of usable nutrients in streams and rivers can influence the community structure and growth of periphyton and diatoms (Stevenson et al. 1991), thereby affecting higher levels of the food web. Large river systems that are regulated by dams for flood control or hydropower may change in community structure of algae, aquatic insects, and fishes over time (Hauer and Stanford 1997). A similar situation exists on the Kootenai River where Libby Dam, since its construction in the early 1970s, significantly alters flow regimes and channel morphology. Libby Dam and Lake Koocanusa (reservoir) are responsible for the depletion of nutrients and the decline in primary productivity in the Idaho portion of the Kootenai River (Snyder and Minshall 1996; Woods 1982).

Lake Koocanusa acts as a nutrient sink (Woods 1982; Snyder and Minshall 1996). According to Woods (1982), the reservoir retains approximately 63% of total phosphorus (P) and 25% of total nitrogen (N). Due to low current velocities in the reservoir, these nutrients bind to sediments and precipitate out of solution (Snyder and Minshall 1996), making them unavailable to organisms in the river below the dam. Consequently, the Idaho portion of the Kootenai River is now considered "nutrient poor" (ultraoligotrophic) and P-limited (Snyder and Minshall 1996). Reduced nutrients render a reduction in food production, which may be a major contributor to poor sportfish production over the past two decades.

Evidence of community shifts in the Kootenai River has been seen at many levels of the food chain. For example, normal macroinvertebrate abundance and species diversity prior to Libby Dam's construction was significantly higher in the upper canyon sections and is now considered low in relation to other rivers in north Idaho (Bonde and Bush 1975; Snyder and Minshall 1996). In addition, specialist species such as caddisflies, stoneflies, and mayflies have since decreased in numbers (Hauer and Stanford 1997), and more generalist species such as aquatic worms have increased (Charlie Holderman, personal communication, Kootenai Tribe of Idaho, Bonners Ferry, Idaho, 2002). As a result, problems amass with those fish that rely on insect diversity for survival. Recent investigations have also shown shifts in fish species from feeding "specialists" such as rainbow trout *Oncorhynchus mykiss* and mountain whitefish *Prosopium williamsoni* (to more habitat and feeding "generalists" such as peamouth and largescale suckers *Catostomus macrocheilus* (Paragamian 2002).

Primary production is thought to be the central foundation of bioenergetic development in the higher trophic levels (Vannote et al. 1980). Successful increases in primary production have been achieved with the addition of inorganic P and N (Ashley et al. 1999). It has been proposed that increases in primary production through fertilization would stimulate fish production in the Kootenai River from the bottom of the food web up (Snyder and Minshall 1996). The addition of nutrients is consistently utilized in aquaculture to increase fish biomass and has proven to be successful in recovering wild fish populations as well. For example, a large-scale nutrient enhancement program was implemented in the north arm of Kootenay Lake, British Columbia (BC) in 1992 in an attempt to recover declining kokanee *Oncorhynchus nerka* populations. The results of this implementation significantly increased all levels of the food web (Ashley et al. 1999). Significant increases in zooplankton, the main diet for kokanee, resulting from increases in algal growth, were sufficient to produce increases in kokanee numbers. Within seven years, kokanee spawners in two main tributaries to the north arm increased from 300,000 in 1992 to 2.1 million in 1998. A similar study in the Upper Arrow Reservoir, BC in 1999 showed that two years of nutrient enhancement resulted in higher escapements, increased size at maturity, increased fecundity, and a recruit:spawner ratio greater than one for kokanee (Pieters et al. 2003).

The Kootenai River Ecosystem Project was designed to take a more holistic, ecosystem-based approach to rehabilitating the post-development Kootenai River fisheries. Past fisheries management programs on the Kootenai River have focused on recovering a single species. This project was designed to help support recovery of fish populations through an ecosystem-based strategy rather than simply treating the symptoms of degrading stocks. The addition of nutrients to this ultraoligotrophic system (Kootenai River downstream of Libby Dam) may stimulate production in the River’s depleted food web and annul downward trends in fish populations such as trout, kokanee, mountain whitefish, burbot *Lota lota*, and white sturgeon *Acipenser transmontanus*.

RESEARCH GOALS

1. Restore fish communities in the Idaho reach of the Kootenai River and improve angler fishing success.

OBJECTIVES

1. To collect baseline information at the microinvertebrate and fish community levels of the food web, which will later be used to monitor post-fertilization changes in the ecosystem.

2. To determine angler harvest pressure and catch rates by continuing a random stratified creel survey on the Kootenai River.

STUDY AREA

The Kootenai River headwaters originate in Kootenay National Park in southeastern BC, Canada (Figure 1). From there, they flow southward into northwestern Montana where they are impounded by Libby Dam, forming Lake Koocanusa. From there, they turn westward and flow into the northeastern portion of the Idaho Panhandle, then flow northward back into BC into Kootenay Lake, and finally to their confluence with the Columbia River at Castlegar, BC. The Kootenai River is the second largest of the Columbia River tributaries and the third largest in drainage (approximately 50,000 km^2; Bonde and Bush 1975). The study area consists of approximately 106 km (river kilometer [rkm] 170 to rkm 276) of the river that flows through the Idaho Panhandle, along with several reference (control) sections in Montana.

The Montana and Idaho portion of the Kootenai River below Libby Dam (rkm 352) can be separated into three distinct stream habitat types. Directly below the dam, the river flows through a narrow canyon section characterized by steep canyon walls, high gradients, and boulder/cobble substrates (rkm 352 to 258.5). As the river flows through the northeast corner of the Idaho Panhandle, there is a gradient transition at Bonners Ferry. Upriver from Bonners Ferry, the channel has an average gradient of 0.6 m/km, and the velocities are often higher than 0.8m/s. There is a braided transition reach from the Moyie River (rkm 258.5) to Bonners Ferry (rkm 244.5). Downriver from Bonners Ferry, velocities slow to usually less than 0.4 m/s; average gradient is 0.02 m/km, the channel deepens, and the river meanders through the Kootenai Valley (rkm 244.5 to rkm 121).

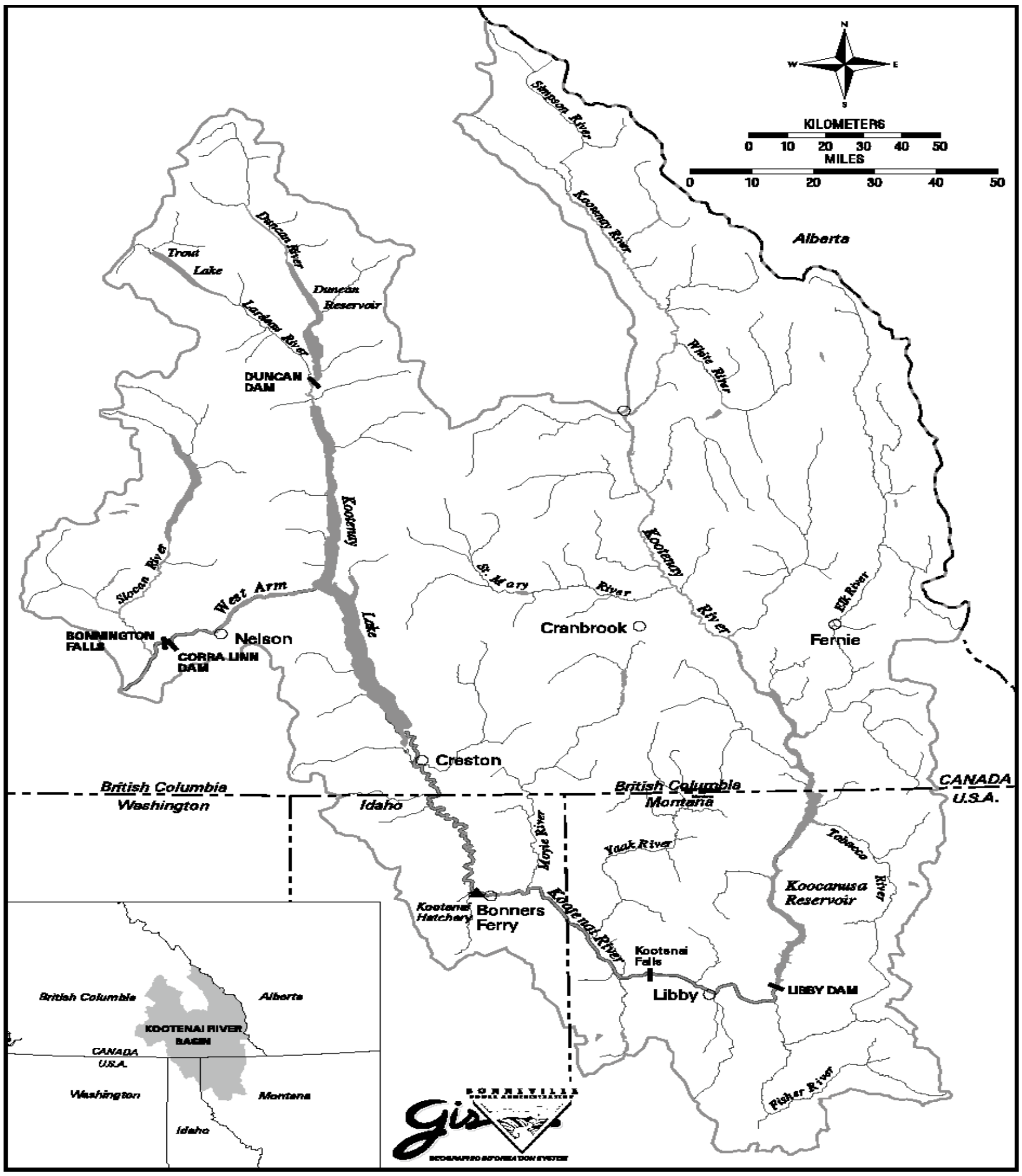

Figure 1. Location of the Kootenai River, Kootenay Lake, Lake Koocanusa, Libby Dam, Bonners Ferry, and important points. River distances are in rkm.

In the Montana and Idaho section of the Kootenai River, five ecosystem biomonitoring sites have been established to gather baseline data pre- and post-fertilization (Figure 2). The first site (KR10) is in the Montana portion of the canyon section at rkm 283 (UTM 0574294 5381592). This location is often referred to as the Yaak River site due to its proximity to the Yaak River approximately 3 rkm upstream (Figure 2). This site is to serve as a reference site (nontreatment) in the ecosystem restoration project. The second site (KR 9) in the canyon section is located at Hemlock Bar (often referred to as the Hemlock Bar site) approximately 18 km downstream at rkm 265 (UTM 0563707 5393213). A single site (KR 6) is located in the braded canyon section above Bonners Ferry at rkm 250 (UTM 0554277 5394630) near the Cow Creek tributary, referred to as the Cow Creek site. The next two sites are located in the meander reach below Bonners Ferry at rkm 230 (UTM 0544834 5402535), referred to as the Shortys Island site (KR 4), and at rkm 170 (UTM 0534892 5427171) near the Canadian border, referred to as the Porthill site (KR 2).

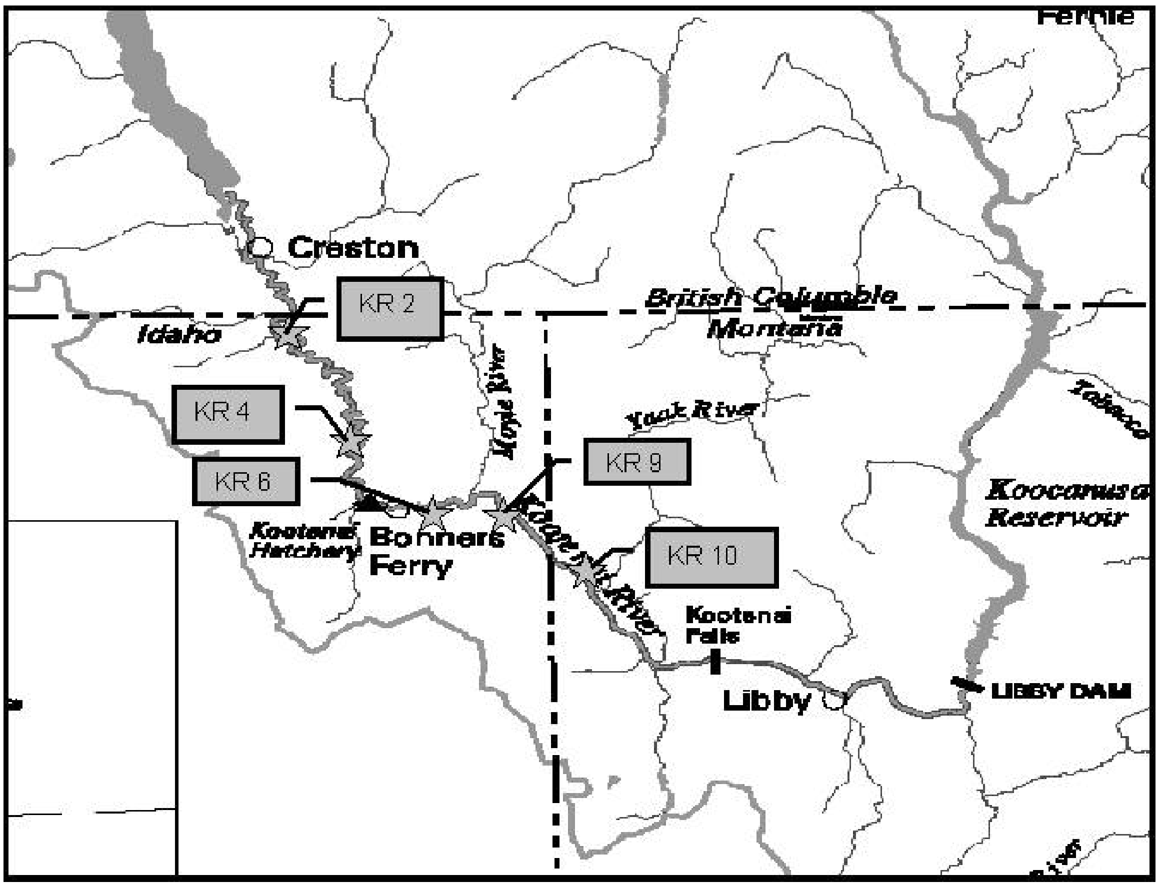

Figure 2. Kootenai River ecosystem study area and approximate locations of biomonitoring sites.

METHODS

Microinvertebrate Abundance

Zooplankton were sampled in 2002, first to determine a general reference to species abundance and composition, and second to provide temporal baseline data for determining changes following possible nutrient enhancement. Microinvertebrates (zooplankton) were sampled at three biomonitoring sites (rkm 283, 265, and 250) on the Kootenai River from June through the end of the year, with collections once each month from the left, center, and right channel. Zooplankton were collected by filtering 10 L of water through a 1 L straining cup lined with a 63 µm mesh filter material. Samples were taken approximately 0.3 m below the water's surface (crustacia and rotifers were assumed to be evenly mixed in a lotic system). Contents were then rinsed into 60 ml NALGENE® bottles and preserved with 0.05-0.1 ml of Lugol's iodine solution per 1 ml sample volume. Four 1 ml aliquots from each sample were analyzed to the most specific taxonomic identification of crustacia and rotifers. Resulting zooplankton and rotifer counts from subsamples were then expanded to determine numbers per liter.

Fish Community Assessment

Species Abundance/Catch and Biomass Rates

In September of 2002, each of the five biomonitoring sites was electrofished to identify relative species abundance as catch per unit of effort (CPUE), abundance by weight as biomass per unit of effort (BPUE), relative weight (Wr) and condition (K), and trophic structure. These data will add to a database to document trends in the fish community over time and will be used as "pretreatment" data for the proposed nutrient enhancement of the Idaho section of the Kootenai River. Sites were sampled using a 5 m jet boat equipped with a Coffelt VVP-15 electroshocker powered by a 5000 watt Honda generator. Typically, electrofish settings were set to generate 6-8 amps at 175-200 volts. The sampling crew consisted of two netters and one driver, who had control of the safety microswitch. All fish species, regardless of size, were netted in order to get a representative sample of the fish community structure at each site. To increase our replication, each biomonitoring section (left and right shoreline) was divided into six equal subsections of 333 m with 150 m separating each to ensure each site was independent of the next. This protocol allowed one km of electrofishing on both banks for a total of two km of sampling. Electrofishing began at rkm 284.5, 266, 251, 231, and 172 and worked upstream at each site, respectively. A single pass was made through each subsection, starting with lower sections first to ensure no fish drifted into areas not yet sampled. After each subsection was shocked, the elapsed sampling time was recorded, and collected fish were taken back to a workup station (a convenient, safe spot on the shoreline). At the workup, fish were anesthetized, identified to species, measured (total length [TL], mm), enumerated, and weighed (g). A subsample of scales from the most abundant species at each site were taken (10 fish in each 10 mm class interval) for aging.

Relative Weight (Wr) and Condition Factor (K)

Fulton's condition factor (K) was used as a measure to gauge changes in body form. K is a ratio between the observed weight and an expected weight dependent on the fish's length (Blackwell et al. 2000). Fulton's condition factor is calculated using the following formula:

$$K = (W/L^3) \times 10^5,$$

where W is the weight of the fish in grams, L is the length in millimeters, and 10^5 is a constant used for scaling purposes. A condition of 1 represents optimal growth. Condition assumes that a fish grows isometrically (becoming more round with increasing length). With that rarely being the case (Bolger and Connolly 1989; McGurk 1985), we additionally calculated relative weight (Wr), which compares Kootenai River fish weight to that of a standard developed for each species. Relative weight is calculated using the formula:

$$Wr = (W/Ws) \times 100,$$

where W is the actual fish weight, and Ws is a standard weight for fish of the same length. A Wr of 100 is considered optimal. Relative weight was calculated for rainbow trout, mountain whitefish, and northern pikeminnow *Ptychocheilus oregonensis*, the only fish sampled with a Ws available (Anderson and Neumann 1996). Minimum total lengths to calculate Ws were 120 mm for rainbow trout, 140 mm for mountain whitefish, and 250 mm for northern pikeminnow (Parker et al. 1995; Rogers et al. 1996; Simpkins and Hubert 1996). For purposes of comparing Wr between sites, the Wr of each species was summarized by 100 mm classes. Statistical differences in condition and relative weights were tested using 1-way ANOVAs (GLM, general linear models; SYSTAT 7.0 1997). Least-square means (LSMs) were used for a posteriori comparisons, and probabilities were adjusted for multiple comparisons using Tukey's correction (SYSTAT 7.0 1997). Level of significance for main effects and a posteriori comparisons were set at an α of 0.05.

Feeding Guilds and Tolerance

All species sampled were classified by feeding guild and relative resistance to habitat disturbances as specified in Zaroban et al. (1999). Feeding guilds utilized for the sample were omnivore, invertivore, and invert-piscivore. Omnivores primarily eat plant and animal material (min of 25% each). Invertivores are described as those species that feed primarily on invertebrate prey, primarily insects. Invert-piscivores consume considerable proportions of fish and invertebrates and typically have an enlarged mouth relative to nonpiscivorous species (Zaroban et al. 1999). Disturbance or pollution tolerance was classified as follows: sensitive—those species that tend to either disappear or are greatly reduced in association with human disturbances (Karr et al. 1986); tolerant—those species that tend to increase with human disturbances (Zaroban et al. 1999); and intermediate—species tend to be neither tolerant nor sensitive to disturbance (increased siltation, turbidity, temperature, or lowered dissolved oxygen; Zaroban et al. 1999).

Age and Growth

Rainbow trout, mountain whitefish, peamouth chub *Mylocheilus caurinus*, and largescale sucker *Catostomus macrocheilus* scales were impressed onto cellulose acetate slides and viewed on a microfiche reader at 42X similar to methods described by Nielsen and Johnson (1985); data are still being analyzed to develop a length at age regression and will be available in the 2003 annual report.

Sportfishing Effort and Harvest

A stratified random creel survey was conducted on the upper Kootenai River (rkm 275.5 to 240.5) from March 1, 2002 through February 28, 2003 to gather prefertilization information regarding angling effort and catch and harvest rates. The river was stratified into two sections with both sections sampled each creel day. Section 1 extended from the Idaho-Montana border (rkm 275.5) downstream to the Highway 95 bridge at Bonners Ferry (rkm 245), and section 2 extended from the Highway 95 bridge downstream to Deep Creek (rkm 240.5). Paragamian's 1993 (Paragamian 1995) creel survey indicated that the majority of fishing pressure occurs within these two sections. The creel survey incorporated a computer based creel program (McArthur 1992), which provided summary creel calculations and determined random instantaneous creel counts by date. Due to an extremely low number of angler interviews during December and January of the 1994 and 2001 surveys, the 2002-03 survey does not include these two months and resumed February 2003 (11 intervals instead of the previous 13). Similar to the 2001 creel (Walters in review), anglers were asked if they used two rods simultaneously so as to estimate the percentage of Kootenai River fishermen taking advantage of Idaho's two-pole stamp.

RESULTS

Microinvertebrate Abundance

Nine species of zooplankton and 30 species of rotifers were identified in the samples (n = 51) filtered throughout the 2002 growing season (June through November). Mean zooplankton densities reached as high as 20/L (standard error [SE] ± 3.52) in June and decreased to as low as 0.13/L (SE ± 0.53) in October (Figure 3). Mean rotifer numbers peaked in August to as high as 241/L (SE ± 14.89) and decreased to as low as 15/L (SE ± 1.45) in October (Figure 3). Site to site differences within each month were minimal. Zooplankton numbers followed a similar trend as the mean river discharge from Libby Dam (Figure 4). Mean zooplankton proportions were dominated by the subclass Copepoda (*Naplii, Cyclopoid copepodite, Cyclops bicuspidatus, Calanoid copepodite*) along with small proportions from the subclass Cladocera (*Alona costata and Bosmina longirostris*; Appendices A-C). Similar proportions of the same species were represented at all three of the sites (rkm 251, 265, and 283). Mean rotifer proportions at all sites were dominated by two main species: *Keratella cochlearis* and *Polyarthra remata* along with small proportions of *Ascomorpha ovalis*, *Collotheca mutabilis*, and *Kellicottia longispina* (Appendices A-C). Similar proportions of the same species were represented at all three of the sites.

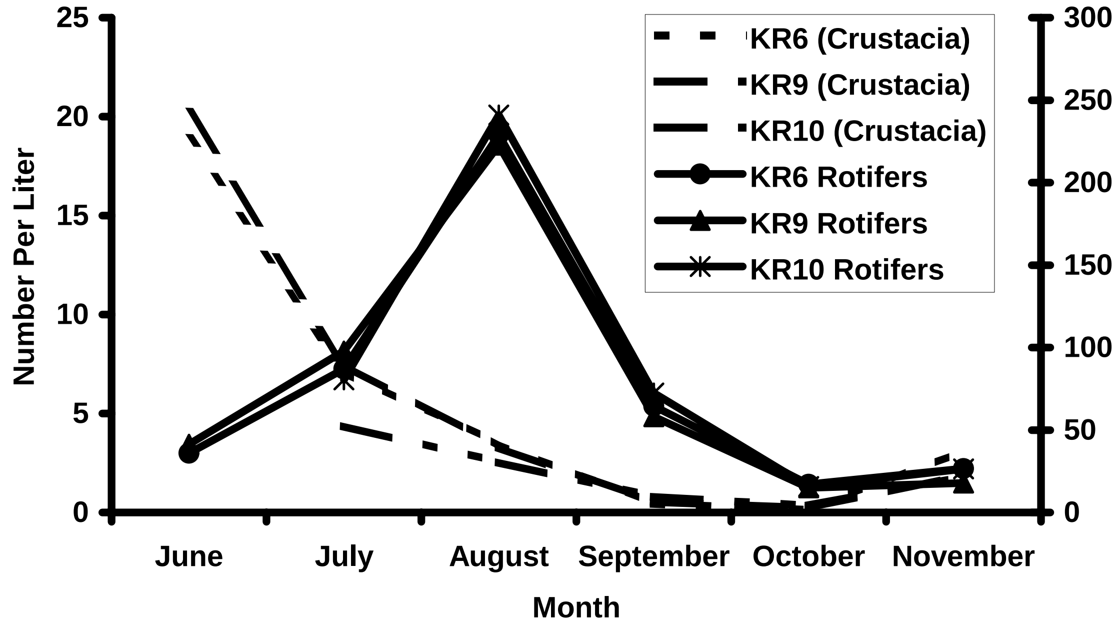

Figure 3. June through November 2002 zooplankton densities (crustacia and rotifers) from the upper Kootenai River at rkm 283, 265, and 251.

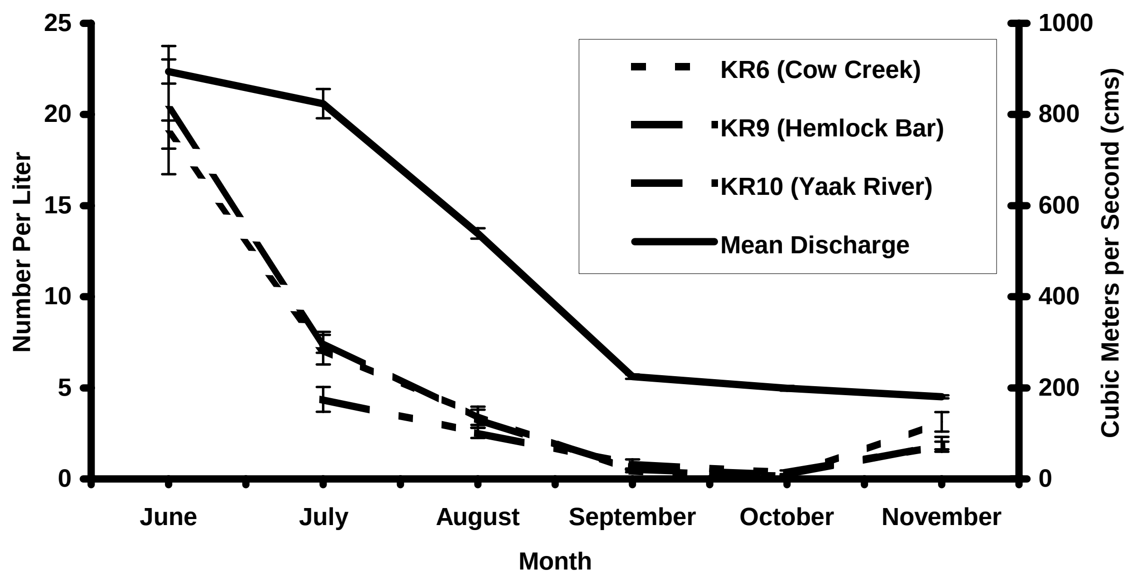

Figure 4. Mean Libby Dam discharge (June through November 2002) and zooplankton densities from the upper Kootenai River at rkm 283, 265, and 251.

Fish Community Assessment

Species Abundance

Fourteen species of fish were identified from the electrofishing samples during 2002 (Table 1). Four of the species (northern pikeminnow, mountain whitefish, redside shiner *Richardsonius balteatus*, and largescale sucker) that are relatively tolerant or intermediately tolerant to habitat disturbances were found at all of the biomonitoring locations, while none of the species (e.g., rainbow trout, westslope cutthroat trout *O. clarki lewisi*, and kokanee) that are considered sensitive to such perturbations were located at the Porthill site (rkm 170; Table 1). Species diversity ranged from 8-11 with the highest diversity located in the braided section above Bonners Ferry near Cow Creek (rkm 251; Table 1).

Although burbot and Kootenai River white sturgeon are known to be present in small numbers, none was sampled in our index sites.

Catch and Biomass Rates

Total catch and biomass per unit of effort (CPUE and BPUE across species) varied from upriver to downriver locations. The highest total CPUE was located in the braided reach (rkm 251) at 383 fish/h, while the lowest catch rate (144 fish/h) occurred in the upper canyon reach at the Yaak River site (rkm 283; Figure 5). The highest BPUE (55 kg/h) was sampled in the upper canyon at the Hemlock Bar reach (rkm 265), while the lowest (18 kg/h) occurred in the meander reach at Porthill (rkm 170; Figure 6).

Numbers of largescale suckers, mountain whitefish, redside shiners, and rainbow trout were consistently higher than those of other species in catch and biomass rates in the upper sites (rkm 283, 265, and 251; Tables 2-4). Of the upper sample sites, the Hemlock bar reach (rkm 265) was highest in mean catch and biomass rates of largescale sucker, (22 kg/h [SE ± 7]; 37 fish/h [SE ± 15], respectively) as well as biomass rates of mountain whitefish (35 kg/h [SE ± 18]), yet catch rates of mountain whitefish peaked in the braided reach (rkm 251) at 251 fish/h (SE ± 64; Tables 2-4). In the meander reach sites (rkm 230 and 170), rainbow trout and mountain whitefish were negligible in numbers and biomass; however, northern pikeminnow and peamouth chub increased in both parameters (Tables 5-6). Mean CPUE at rkm 230 was similar across these species, yet biomass was predominantly tied up in largescale sucker (22 kg/h [SE ± 11]; Table 5). The furthest downriver site in the meander reach (rkm 170) was highest in mean catch rates by northern pikeminnow (99 fish/h [SE ± 20]) and redside shiner (62 fish/h [SE ± 78]), yet was dominated in biomass by largescale sucker (14 kg/h [SE ± 3]; Table 6). Largescale suckers were the only species that showed high catch and biomass rates at all of the sites sampled. Mean BPUE and CPUE of largescale sucker were highest at the Shortys Island site (rkm 230; Table 5).

Relative Weight (Wr) and Condition Factor (K)

Relative weights for rainbow trout and mountain whitefish (all size classes) declined from upper to lower sites (Tables 7-8). Relative weight for rainbow trout in the 201-300 mm size classes had the highest relative weights in the upper canyon, while those in the 301-400 mm size class had the poorest Wr as we sampled downstream into the braided and lower river sections (Table 7). Relative weight for mountain whitefish was higher in the 301-400 mm size classes in the upper canyon and braided sections and lowest for those in the 101-200 mm size class as we sampled downstream (Table 8). Relative weight of northern pikeminnow (all size classes) was poor relative to the standard, ranging from 53 to 68 at all river sections (Table 9). The number of pikeminnow greater than 250 mm (minimum required to calculate Wr) declined greatly as we sampled upstream of rkm 170 (rkm 283-230).

Condition factor (K) was calculated for largescale suckers, peamouth chub, and redside shiners. Condition for largescale sucker in all size classes was not significantly different between sections except rkm 251 ($P > 0.001$) in the braided reach (Table 10). Few largescale suckers were collected under 301 mm across all sample sites. Condition for peamouth chub and redside shiners show similar trends as rainbow trout and mountain whitefish in having a "better" condition in the upper canyon reach and braided sections (ranging from 0.81 to 0.98) than in the lower sections (ranging from 0.73 to 0.80; Tables 11-12). However, there were relatively fewer peamouth chub in the upper canyon sections.

Feeding Guild and Tolerance

Feeding guilds changed considerably in percent of total catch and biomass as we sampled from the upper river to lower river sections. In the upper river sections, invertivore species increased in percent of total catch and percent of total biomass as we sampled from rkm 283 to 251 (64 and 35% to 85 and 63%, respectively; Tables 13-15). However, in the lower river sections there were substantial declines in both catch and biomass of invertivore species and an increase in percent of total catch of invert-piscivores (range of 32-47%). The percent of total biomass, however, was primarily made up of omnivore species in these two sample sections (range of 71–75%; Tables 16-17). For a full list of species classified by feeding guild and tolerance, see Table 1.

Tolerance classifications also showed considerable changes in proportion of catch and biomass as we moved from upper to lower river sections in our sampling. Overall, there was a shift from high proportions of sensitive and intermediate species in the upper river sections to more tolerant species in the lower river sections (Tables 13-17). In the upper canyon sections, intermediate and tolerant species represented a relatively high percent of the total catch (63-76% and 44% respectively) and biomass (35 and 48% and 47% respectively). River kilometer 251 in the braided reach showed the highest percent of total catch and biomass of intermediate species of all of the upper river sample sites at 84 and 61%, respectively (Table 15). The two lower river sections in the meander reach (rkm 230 and 170) were negligible in percent of total catch (<2%) and biomass (<2%) of sensitive species and highest in percent of total catch (54 and 58% respectively) and percent of total biomass (77 and 90% respectively) in tolerant species (Tables 16-17).

Table 1. Species sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. I = Intolerant; T = Tolerant; S = Sensitive (describes response to habitat perturbations; Zaroban et al. 1999).

	Sample location						
Species	**rkm 283**	**rkm 265**	**rkm 250**	**rkm 230**	**rkm 170**	**Feeding guild**	**Tolerance**
Brown trout *Salmo trutta*			X			Invert-Piscivore	I
Bull trout *Salvelinus confluentus*	X					Invert-Piscivore	S
Kokanee *Oncorhynchus nerka*	X	X	X	X		Invertivore	S
Largescale sucker *Catostomus macrocheilus*	X	X	X	X	X	Omnivore	T
Longnose dace *Rhinichthys cataractae*			X			Invertivore	I
Longnose sucker *Catostomus catostomus*			X	X	X	Invertivore	I
Mountain whitefish *Prosopium williamsoni*	X	X	X	X	X	Invertivore	I
Northern pikeminnow *Ptychocheilus oregonensis*	X	X	X	X	X	Invert-Piscivore	T
Peamouth chub *Mylocheilus caurinus*	X		X	X	X	Invertivore	I
Rainbow trout *O. mykiss*	X	X	X	X		Invert-Piscivore	S
Redside shiner *Richardsonius balteatus*	X	X	X	X	X	Invertivore	I
Torrent sculpin *Cottus rhotheus*		X			X	Invert-Piscivore	I
Westslope cutthroat trout *O. clarki*	X	X	X			Invert-Piscivore	S
Yellow perch *Perca flavescens*				X	X	Invert-Piscivore	I
Total number of species	9	8	11	9	8		

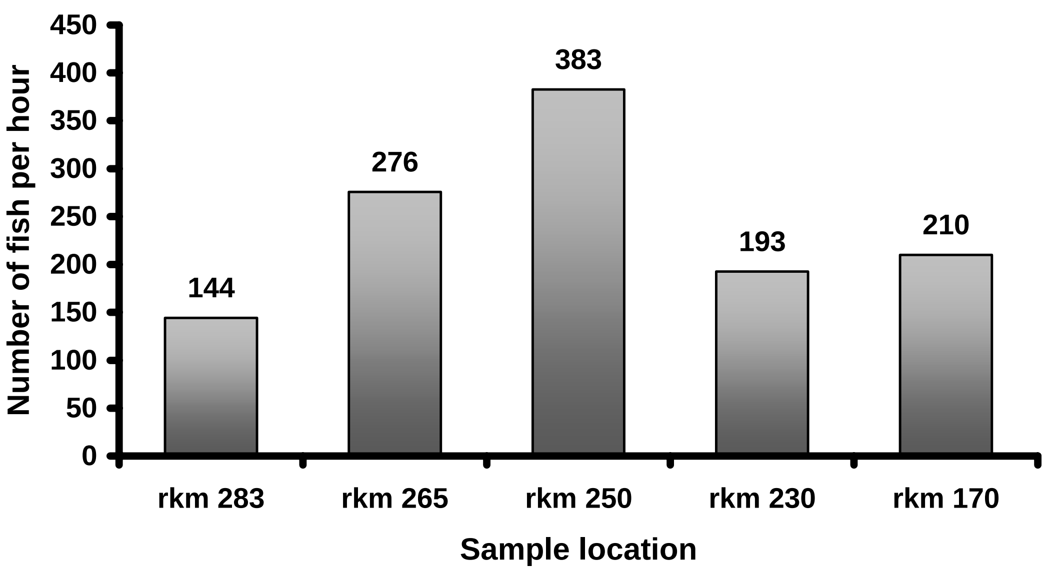

Figure 5. Total catch per unit of effort (CPUE) for all combined species sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear.

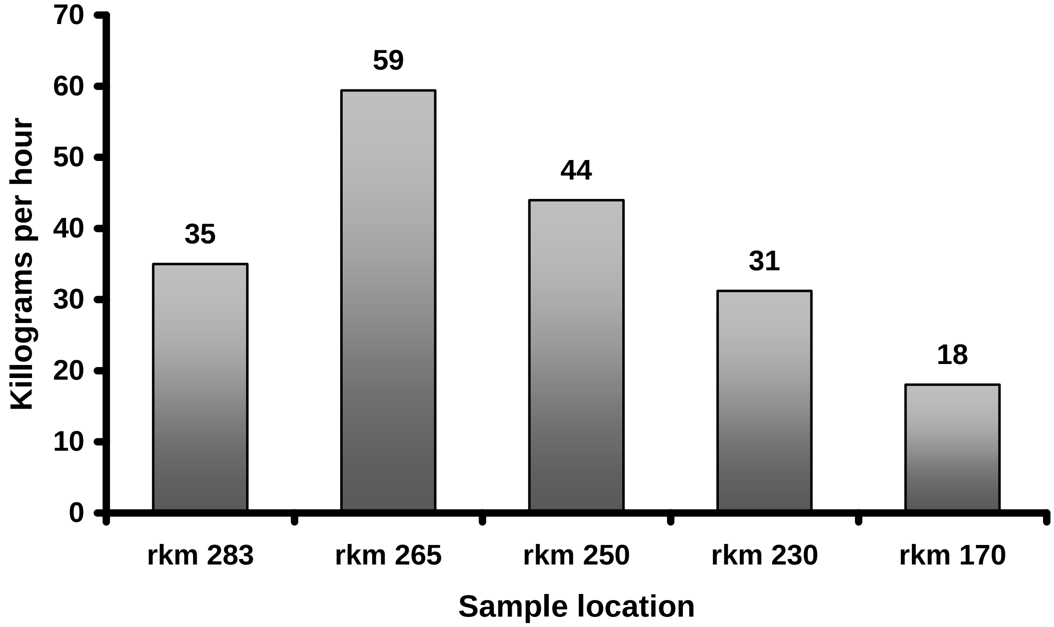

Figure 6. Total biomass per unit of effort (BPUE) for all combined species sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear.

Table 2. Mean catch and biomass per unit of effort (CPUE and BPUE), total number and biomass, and mean weight of fish sampled during boat electrofishing at rkm 283 (Yaak River, Montana reach). SE = ± 1 standard error.

Species	Number caught	% of total catch	Mean CPUE (n/h)	SE	Total biomass (kg)	% of total biomass	Mean BPUE (kg/h)	SE	Mean weight (g)
Bull trout	2	1.05	2.05	1.32	5.13	11.19	5.31	3.47	2563
Kokanee	2	1.05	1.86	1.24	0.08	0.17	0.07	0.05	39
Largescale sucker	33	17.28	23.85	3.99	19.54	42.65	13.84	3.32	531
Mountain whitefish	93	48.69	92.29	62.60	15.18	33.13	15.64	12.01	135
Northern pikeminnow	9	4.71	5.70	2.66	0.72	1.58	0.44	0.23	75
Peamouth chub	2	1.05	1.65	1.04	0.28	0.62	0.24	0.16	142
Rainbow trout	24	12.57	17.23	5.10	4.18	9.11	2.92	1.44	138
Redside shiner	25	13.09	18.99	8.57	0.47	1.03	0.36	0.22	14
Westslope cutthroat	1	0.52	0.51	0.51	0.24	0.52	0.12	0.12	240

Table 3. Mean catch and biomass per unit of effort (CPUE and BPUE), total number and biomass, and mean weight of fish sampled during boat electrofishing at rkm 265 (Hemlock Bar reach). SE = ± 1 standard error.

Species	Number caught	% of Total catch	Mean CPUE (n/h)	SE	Total biomass (kg)	% of total biomass	Mean BPUE (kg/h)	SE	Mean weight (g)
Kokanee	8	4.02	11	6	0.84	1.95	1.10	0.64	109
Largescale sucker	28	14.02	37	15	15.42	35.94	21.91	7.16	628
Mountain whitefish	132	66.33	220	104	20.38	47.52	35.41	17.48	156
Northern pikeminnow	10	5.03	13	5	4.71	10.97	6.00	3.54	423
Rainbow trout	7	3.52	9	5	1.25	2.90	1.56	0.84	179
Redside shiner	12	6.03	16	11	0.12	0.29	0.17	0.12	9
Torrent sculpin	1	0.50	1	1	0.00	0.01	0.00	0.00	3
Westslope cutthroat	1	0.50	1	1	0.19	0.43	0.22	0.22	185

Table 4. Mean catch and biomass per unit of effort (CPUE and BPUE), total number and biomass, and mean weight of fish sampled during boat electrofishing at rkm 251 (Cow Creek reach). SE = ± 1 standard error.

Species	Number caught	% of Total catch	Mean CPUE (n/h)	SE	Total biomass (kg)	% of total biomass	Mean BPUE (kg/h)	SE	Mean weight (g)
Brown trout	1	0.36	1.24	1.44	0.05	0.17	0.08	0.08	54
Kokanee	7	2.51	8.33	3.91	0.74	2.31	1.03	0.42	105
Largescale sucker	16	5.73	18.91	5.36	8.93	27.85	12.49	2.83	576
Longnose dace	1	0.36	1.15	1.34	0.00	0.00	0.00	0.00	1
Longnose sucker	1	0.36	1.22	1.42	0.27	0.83	0.38	0.38	265
Mountain whitefish	219	78.49	251.05	64.22	18.49	57.67	24.67	6.86	86
Northern pikeminnow	6	2.15	7.52	4.16	0.42	1.31	0.62	0.31	91
Peamouth chub	4	1.43	4.55	1.69	0.78	2.45	1.03	0.41	196
Rainbow trout	15	5.38	17.26	4.12	1.86	5.81	2.55	0.60	160
Redside shiner	8	2.87	9.58	5.28	0.07	0.20	0.09	0.04	8
Westslope cutthroat	1	0.36	1.09	1.27	0.45	1.41	0.57	0.57	452

Table 5. Mean catch and biomass per unit of effort (CPUE and BPUE), total number and biomass, and mean weight of fish sampled during boat electrofishing at rkm 230 (Shortys Island reach). SE = ± 1 standard error.

Species	Number caught	% of total catch	Mean CPUE (n/h)	SE	Total biomass (kg)	% of total biomass	Mean BPUE (kg/h)	SE	Mean weight (g)
Kokanee	1	0.31	0.63	0.63	0.08	0.15	0.05	0.05	77
Largescale sucker	80	24.84	47.88	19.34	37.12	71.14	22.46	11.06	455
Longnose sucker	4	1.24	2.26	1.63	0.93	1.78	0.53	0.35	267
Mountain whitefish	3	0.93	1.82	1.27	0.12	0.23	0.07	0.05	40
Northern pikeminnow	95	29.50	55.83	10.72	3.10	5.93	1.78	0.55	33
Peamouth chub	76	23.60	44.43	11.22	9.74	18.67	5.74	1.18	155
Rainbow trout	6	1.86	3.63	1.90	0.72	1.37	0.43	0.24	109
Redside shiner	56	17.39	33.97	12.01	0.30	0.58	0.18	0.06	6
Yellow perch	1	0.31	0.63	0.63	0.08	0.15	0.05	0.05	79

Table 6. Mean catch and biomass per unit of effort (CPUE and BPUE), total number and biomass, and mean weight of fish sampled during boat electrofishing at rkm 170 (Porthill reach). SE = ± 1 standard error.

Species	Number caught	% of Total catch	Mean CPUE (n/h)	SE	Total biomass (kg)	% of total biomass	Mean BPUE (kg/h)	SE	Mean weight (g)
Largescale sucker	41	12.77	27.43	2.64	20.70	75.09	14.40	2.50	514
Longnose sucker	3	0.93	1.75	0.79	0.23	0.82	0.13	0.06	76
Mountain whitefish	4	1.25	2.54	1.61	0.06	0.22	0.04	0.03	15
Northern pikeminnow	146	45.48	98.70	19.73	4.13	14.97	2.85	0.71	27
Peamouth chub	29	9.03	18.32	4.62	1.86	6.73	1.16	0.37	61
Redside shiner	93	28.97	62.51	8.45	0.56	2.04	0.39	0.07	6
Torrent sculpin	3	0.93	1.62	1.06	0.02	0.07	0.01	0.01	7
Yellow perch	2	0.62	1.56	1.09	0.01	0.05	0.01	0.01	7

Table 7. Relative weights (Wr) of rainbow trout (RBT) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	RBT TL classes (mm)														
	101-200			201-300			301-400			>401			All lengths		
Rkm	Wr	SE	n	Wr	SE	n	Wr	SE	n	Wr	SE	n	Wr	SE	n
283	93	2	10	96	2	9	91	7	4	80	—	1	93[a]	2	24
265	91	2	4	94	5	2	88	—	1	—	—	—	91[a,b]	2	7
251	91	2	8	88	1	3	74	5	4	—	—	—	86[b,c]	2	15
230	84	3	3	80	5	2	71	—	1	—	—	—	81 [c]	3	6
170	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0

[a-c] Wr with similar letters are not significantly different.

Table 8. Relative weights (Wr) of mountain whitefish (MWF) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	MWF TL classes (mm)														
	101-200			201-300			301-400			>401			All lengths		
Rkm	Wr	SE	n	Wr	SE	n	Wr	SE	n	Wr	SE	n	Wr	SE	n
283	85	3	8	94	1	73	96	2	4	82	0	2	93[a]	1	87
265	76	1	19	85	1	104	87	4	3	82	4	4	84[b]	1	130
251	78	1	56	79	1	109	94	1	2	88	—	1	79[c]	1	168
230	73	2	3	—	—	—	—	—	—	—	—	—	73[b,c d]	2	3
170	63	3	2	—	—	—	—	—	—	—	—	—	63[d]	3	2

[a-d] Wr with similar letters are not significantly different.

Table 9. Relative weights (Wr) of northern pikeminnow (NPM) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	NPM TL classes (mm)											
	201-300			301-400			>401			All lengths		
Rkm	**Wr**	**SE**	**n**	**Wr**	**SE**	**n**	**Wr**	**SE**	**n**	**Wr**	**SE**	**n**
283	68	—	1	—	—	—	—	—	—	68[a,b]	—	1
265	59	1.4	2	64	0.3	4	75	0.5	2	66[b]	2.3	8
251	59	—	1	—	—	—	—	—	—	59[a,b]	—	1
230	61	3.8	6	70	—	1	—	—	—	61[a,b]	3.5	7
170	53	0.9	5	—	—	—	—	—	—	53[a]	0.9	5

[a-b] Wr with similar letters are not significantly different.

Table 10. Fulton's condition factor (K) of largescale suckers (LSS) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	LSS TL classes (mm)														
	101-200			201-300			301-400			>401			All lengths		
Rkm	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**
283	—	—	—	1.00	0.05	2	0.88	0.02	15	0.93	0.02	15	0.91[a]	0.02	32
265	0.81	—	1	0.74	—	1	0.85	0.03	16	0.88	0.06	10	0.86[a,b]	0.02	28
251	1.11	—	1	0.82	—	1	0.82	0.02	8	0.91	0.05	6	0.79[b]	0.02	16
230	0.86	0.05	5	0.90	0.05	7	0.86	0.02	33	0.89	0.03	27	0.91[a]	0.01	72
170	1.00	0.03	8	—	—	—	0.94	0.03	13	0.91	0.02	20	0.91[a]	0.02	41

[a-b] K with similar letters are not significantly different.

Table 11. Fulton's condition factor (K) of peamouth chub (PMC) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	PMC TL classes (mm)														
	101-200			201-300			301-400			>401			All lengths		
Rkm	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**	**K**	**SE**	**n**
283	—	—	—	—	—	—	0.97	0.06	2	—	—	—	0.97[a]	0.06	2
265	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
251	—	—	—	0.76	—	1	0.83	0.04	2	0.82	—	1	0.81[a,b]	0.03	4
230	—	—	—	0.71	0.03	10	0.72	0.01	63	1.04	0.05	2	0.73[b]	0.01	75
170	0.77	0.15	3	0.69	0.08	12	0.76	0.01	14	—	—	—	0.74[b]	0.01	110

[a-b] K with similar letters are not significantly different.

Table 12. Fulton's condition factor (K) of redside shiners (RSS) sampled at Kootenai River biomonitoring sites in September 2002 with boat electrofishing gear. SE = ± 1 standard error.

	RSS TL classes (mm)								
	0-100			101-200			All lengths		
Rkm	K	SE	n	K	SE	n	K	SE	n
283	0.93	0.07	5	0.99	0.03	19	0.98[a]	0.03	24
265	0.90	0.07	4	0.91	0.05	8	0.91[a,b]	0.04	12
251	0.94	0.06	4	0.88	0.06	4	0.91[a,b]	0.04	8
230	0.80	0.02	50	0.82	0.04	6	0.80[b,c]	0.02	56
170	0.72	0.02	75	0.82	0.02	17	0.74[c]	0.02	92

[a-c] K with similar letters are not significantly different.

Table 13. Feeding guilds and tolerance of all fish species sampled at rkm 283 (Yaak River, Montana site) in September 2002 with boat electrofishing gear.

Feeding guild and tolerance level	Percent of total catch	Percent of total biomass
Invertivore	64	35
Invert-Piscivore	19	22
Omnivore	17	43
Sensitive species	15	21
Intermediate species	63	35
Tolerant species	22	44

Table 14. Feeding guilds and tolerance of all fish species sampled at rkm 265 (Hemlock Bar site) in September 2002 with boat electrofishing gear.

Feeding guild and tolerance level	Percent of total catch	Percent of total biomass
Invertivore	79	50
Invert-Piscivore	10	14
Omnivore	11	36
Sensitive species	8	5
Intermediate species	76	48
Tolerant species	16	47

Table 15. Feeding guilds and tolerance of all fish species sampled at rkm 251 (Cow Creek site) in September 2002 with boat electrofishing gear.

Feeding guild and tolerance level	Percent of total catch	Percent of total biomass
Invertivore	86	63
Invert-Piscivore	8	9
Omnivore	6	28
Sensitive species	8	10
Intermediate species	84	61
Tolerant species	8	29

Table 16. Feeding guilds and tolerance of all fish species sampled at rkm 230 (Shortys Island site) in September 2002 with boat electrofishing gear.

Feeding guild and tolerance level	Percent of total catch	Percent of total biomass
Invertivore	43	21
Invert-Piscivore	32	7
Omnivore	25	71
Sensitive species	2	2
Intermediate species	43	21
Tolerant species	54	77

Table 17. Feeding guilds and tolerance of all fish species sampled at rkm 170 (Porthill site) in September 2002 with boat electrofishing gear.

Feeding guild and tolerance level	Percent of total catch	Percent of total biomass
Invertivore	40	10
Invert-Piscivore	47	15
Omnivore	13	75
Sensitive species	0	0
Intermediate species	42	10
Tolerant species	58	90

Sportfishing Effort and Harvest

In the 2002 sportfishing survey, we interviewed 145 anglers from 70 contacts (91% were residents; Appendix D). About 54% of the anglers fished from a boat and the remainder from the bank. Of the fishing methods, 50% of the anglers used bait, 33% used flies, and 17% used lures (Appendix D). In addition, approximately 10% (5 of 53) of anglers interviewed fished with two poles. The total estimated effort during this period was 5,612 h (95% CI ± 1,542) (Table 18; Appendix E). Of this total effort, 2,717 h (95% CI = ± 1,264 h) were expended in section 1, and 2,895 h (95% CI = ± 884 h) were spent in Section 2. The average time spent fishing was 4.19 hours/trip for 24 completed trip interviews (Appendix D).

Mountain whitefish was the most common species in the creel with a harvest of 203 (95% Confidence Interval [CI] = ± 193) followed by rainbow trout with a harvest of 95 (95% CI = ± 115; Table 18; Figure 7; Appendix F). Anglers caught an estimated 2,471 fish (± 1,303), of which 561 (± 413) were kept. Catch composition by species as a percentage of total catch in 2002 is as follows: peamouth 48%, northern pikeminnow 21%, mountain whitefish 17%, rainbow trout 12%, and kokanee 2%. The estimated catch rates were 0.13 rainbow trout/h, 0.05 mountain whitefish/h, 0.09 northern pike minnow/h, and 0.09 peamouth chub/h (Appendix G). Anglers who said they were fishing specifically for rainbow trout caught 0.13 rainbow trout/h. Mean total lengths and weights of fish measured in the 2002 creel are given in Table 19.

Table 18. Estimated fishing effort and harvest of fish on the Kootenai River by anglers from March 1, 2002 to March 25, 2003 (rkm 240.5 [Deep Creek] to rkm 275.5 [Montana state line] [95% confidence intervals are subtended]).

					Estimated fish harvested[a]						
Interval	**Period**	**Effort**	**Total catch**	**Total harvest**	**RBT**	**MWF**	**WCT**	**NPM**	**KOK**	**LSS**	**PMC**
1	Mar 1—Mar 30	702	88	18	0	18	0	0	0	0	0
2	Mar 31—Apr 29	797	84	34	17	17	0	0	0	0	0
3	Apr 30—May 29	864	508	255	46	163	0	46	0	0	0
4	May 30—Jun 28	425	0	0	0	0	0	0	0	0	0
5	Jun 29—Jul 28	0	0	0	0	0	0	0	0	0	0
6	Jul 29—Aug 27	1,382	998	30	25	5	0	0	0	0	0
7	Aug 28—Sep 26	820	202	14	7	0	0	0	7	0	0
8	Sep 27—Oct 26	94	15	0	0	0	0	0	0	0	0
9	Oct 27—Nov 25	65	0	0	0	0	0	0	0	0	0
10	Nov 26—Dec 25	0	0	0	0	0	0	0	0	0	0
11	Dec 26—Jan 24	0	0	0	0	0	0	0	0	0	0
12	Jan 25—Feb 23	400	576	210	0	0	0	60	0	0	150
13	Feb 24—Mar 25	63	0	0	0	0	0	0	0	0	0
	Totals	**5,612**	**2,471**	**561**	**95**	**203**	**0**	**106**	**7**	**0**	**150**
		(1,542)	(1,303)	(413)	(115)	(193)	0	(133)	(19)	0	(212)

[a] RBT = rainbow trout; MWF = mountain whitefish; WCT = westslope cutthroat trout; NPM = northern pikeminnow; KOK = kokanee; LSS = largescale sucker; PMC = peamouth chub.

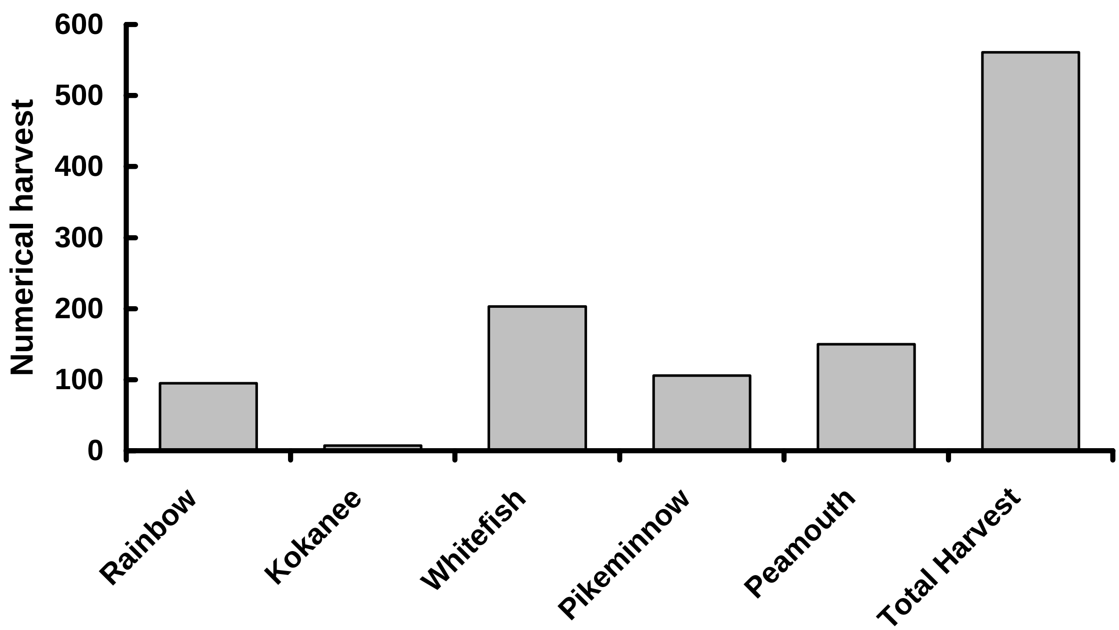

Figure 7. Harvest of five species of fish (including total harvest) in the Kootenai River from rkm 240.5 (Deep Creek) to rkm 275.5 (Montana state line) by anglers between March 1 and November 25, 2002.

Table 19. Mean total lengths and weights of fish measured in the Kootenai River sportfishing survey, March 2002-February 2003.

		Rainbow Trout	Mountain Whitefish	Peamouth Chub
Total Length (mm)				
	n	5	4	3
	Mean	428	354	238
	Standard Error	1.4	3.3	0.8
	Minimum	380	313	222
	Maximum	462	450	250
Weight (g)				
	n	5	4	3
	Mean	68	36	10
	Standard Error	8	11	1
	Minimum	47	0	8
	Maximum	96	0	58

DISCUSSION

Microinvertebrate Abundance

Limited research on zooplankton and no research on the rotifer communities of the Kootenai River have been done to date. Paragamian (1995) and Richards (1998) found zooplankton levels in the Kootenai River below the Libby Dam to be between 0.1 to 3 plankters/L seasonally. Zooplankton numbers in 2002 were several orders of magnitude higher (20/L) in the spring than previous studies by Paragamian (1995) and Richards (1998). However, a spill was occurring from Libby Dam concurrent to zooplankton sampling. This being the case, it is presumed that the higher densities are directly linked to entrainment from Lake Koocanusa. Much of the “true” plankton in large river systems originates in backwater sloughs, side channels, or other gently flowing areas (Hynes 1970). If the retention time of a stream or lake is short, then little plankton may develop (Hynes 1970). Since the Kootenai River is impounded above Libby Dam, much of what is sampled in the water column below the dam is due largely to drift from the reservoir above. Interestingly, many of the species that were identified in the upper river do not coincide with those in the lower river sections (Gretchen Kruse, personal communication, Free Run Aquatic Research, 2003) or that which has been sampled in the upper reservoir (Jim Dunnigan, personal communication, Montana Fish Wildlife and Parks) Therefore, either these variations in species are coming in from other tributaries (draining mountain lakes, etc.) or there is some production of zooplankton in the main Kootenai River. Wetland areas such as the Kootenai Wildlife Refuge and Boundary Creek Wildlife Management Area drain into the Kootenai River below the upper canyon reach. If plans to enhance the river are carried out, it may allow us to actually determine microinvertebrate production in the river as opposed to what is an artifact of drift and/or entrainment.

Fish Community Assessment

Substantial changes in fish assemblages have occurred in the Kootenai River since the construction of Libby Dam (Paragamian 2002). It is very likely that the reduction in river productivity has indirectly reduced fish numbers through lower food abundance (i.e. insect densities). For example, Paragamian (1995) found lower standing stock proportions of mountain whitefish at the Hemlock Bar site than Partridge (1983). At the same time, insect densities decreased in the upper canyon section of the Kootenai River from 3,500 insects/m^2 in the early 1970s (prior to the dam's construction; Bonde and Bush 1975) to 900 insects/m^2 in the mid 1990s (Snyder and Minshall 1996). Current Kootenai River macroinvertebrate densities are low compared to more productive systems such as the Salmon (38,000 insects/m^2) and Coeur d'Alene rivers (63,000 insects/m^2; Royer and Minshall 1997). Dissimilarity in stream flow has been seen to elicit changes in insect abundance, productivity, and species composition (Cushman 1985). Although not directly comparable spatially, our results of the Hemlock Bar area (rkm 283 and 265) were relatively equal in biomass of mountain whitefish and largescale sucker. Largescale sucker catch per unit of effort as well as biomass per unit of effort were highest where the river turns into the meander reach (slower and deeper depositional zone). However, without any information on densities of sucker populations prior to Libby Dam's construction, it is difficult to determine if this was always the case. Examination of the river above the reservoir may give an approximation of how fish assemblages should be structured. Below the dam, the exclusion of peak flows in the spring prevents the flushing of sediments from cobble-gravel substrates, essentially armoring interstitial spaces and reducing habitat heterogeneity (Paragamian 2002). Recently, habitat analysis of sections in this meander reach show cobble and gravel substrates under several layers of sand deposits (Gary Barton, personal communication, USGS, Tacoma, Washington, 2003). It is quite likely that prior to the dam's construction, this area supported higher numbers of invertivores whose life history stages depend on such substrate types.

According to Walters (2002), rainbow trout recruitment in these sections may not be limited only by habitat but additionally by low river productivity. It was evident that the Wr of rainbow trout in the upper river sections was lower than optimal (100) and continued to decline as we moved downstream. Similar low relative weights for rainbows were identified by Walters (2002) and Downs (2000). Relative weights of mountain whitefish were also at suboptimal levels in the upper sites and continued to deteriorate as we sampled downstream. Low relative weights may be indicative of a paucity of suitable prey items (Blackwell et al. 2000; to confirm this speculation, a food habit analysis is currently in progress). In contrast, fish in relatively good condition should be able to utilize more energy for gamete production than fish that are in poor condition. Significant positive correlations between the percentage of mature eggs and fish biomass and Wr have been reported in numerous studies (Wege and Anderson 1978; Neumann and Murphy 1992; Neuman and Willis 1995). The low numbers of northern pikeminnow in samples may not allow us to draw any conclusions about their condition; however, we speculate that the same factors driving K for the other fishes are influencing northern pikeminnow. It is also evident that the omnivorous largescale suckers are well adapted for most areas of the river with little spatial effects on their condition.

As previously mentioned, disturbances in a river can significantly alter fish community assemblages. Because fish communities reflect such aspects as hydrology, water quality, biological interactions, habitat structure, and energy resources, they are useful for assessing the effects of anthropogenic activities across regions (Zaroban et al. 1999). For example, changes in trophic structure from increased pollution tend to favor omnivorous species that are more tolerant of human disturbance (Karr et al. 1986). In the Kootenai River, we saw a shift to a higher proportion in catch and biomass of tolerant species (such as northern pikeminnow and largescale suckers) as we moved to lower river sections. In the Kootenai River's upper river sections, we sampled a greater proportion of intermediate and sensitive species (such as mountain whitefish and bull trout); however, these proportions are thought to have been much higher prior to Libby Dam's construction. A sample location higher in the watershed may provide valuable information on fish assemblages that have not been influenced by the reservoir. Estimated mountain whitefish (an invertivore species) population numbers were four times higher in 1982 (Partridge 1983) than in 1999 (Downs 2000). This reduction is presumably linked to the reduction in macroinvertebrate densities through a loss of habitat and food abundance. Additional examination of this population may further provide information of assemblage shifting in the Kootenai River.

Sportfishing Effort and Harvest

Total estimated sportfishing effort in the 2002-2003 creel was down 59% from the previous year's 13,815 h (± 1,965) at the end of the season. Starting in 2002, a more conservative trout regulation (from six fish any size to two fish; none over 16 inches) was placed into effect to increase the probability of rainbow trout spawning at least once prior to being harvested. These more conservative regulations may have caused some "harvest-oriented" fisherman to stop fishing the Kootenai River. However, it is believed that the reduction in effort is primarily attributed to above average flows from spring runoff, keeping anglers off the river until late July and early August of 2002. Catch rates have increased for mountain whitefish and substantially increased for rainbow trout in the 2001 (Walters in review) and 2002 creel surveys since the survey performed in 1993. In examining the angler demographic changes that have occurred, there has been a substantial decrease in the number of anglers using bait and artificial lures (effort now is dominated by anglers using flyfishing equipment). In addition, there has been an increase in those anglers utilizing boats rather than fishing from shore. These two changes coupled with higher trout catch rates (without an increase in trout densities) may indicate that the Kootenai River is becoming more of a destination fishery for more skilled and serious trout anglers.

Although catch rates for trout have increased since the 1993 season, they are low in comparison with the Kootenai River, Montana where trout catch rates range from about 0.3 fish/h near Troy up to about 0.9 fish/h below Libby Dam. Historical catch information prior to Libby Dam's construction report catch rates in the same general area of around 0.5-0.6 fish/h (May and Huston 1983). Catch rates in other Idaho Panhandle streams included 0.73 trout/h and 0.55 trout/h in the N. Fork Coeur d'Alene River in 1992 and 1996, respectively, and 0.89 trout/h in the St. Joe River in 1996 (Fredericks et al. 1997). Schill (1991) summarized statewide trout fishery statistics for Idaho and reported trout catch rates that averaged 0.94 fish/h for streams with general trout regulations. It would stand to reason that any efforts to increase trout densities through increasing river productivity would, in turn, increase the angler catch rates and the overall fishing experience in the Kootenai River.

Low nutrient and food availability in the Kootenai River has translated into poor relative weights, low spawner fecundity, and reduced catch rates as time progressed. Increases in fish density and fecundity have resulted from stream and lake fertilization programs in Canada (Ashley et al. 1999; Pieters et al. 2003). As mentioned, it is believed that the addition of phosphorus (ammonium polyphosphate) and nitrogen (urea ammonium nitrate) fertilizer to the Kootenai River may stimulate fish production in this "bottom up" fashion. Concerns over the direct effects of these fertilizers on larval fish have been brought up with regards to sensitive species in the river such as the endangered Kootenai River white sturgeon. However, it is unlikely that these species will experience negative direct effects from a nutrient enhancement program.

RECOMMENDATIONS

1. Add nutrients in the form of liquid P fertilizer to enhance river productivity.

2. Add upstream electrofishing reference site in Wardner, BC to compare with lower river sample sites.

3. Perform population estimate of mountain whitefish at the Hemlock Bar reach in order to determine the extent of species shifts since 1999.

ACKNOWLEDGEMENTS

Thanks go to the following people that took part in all of the sampling effort: Charlie Holderman and crew, Jim Dunnigan and crew, Vaughn L. Paragamian, Jody Walters, Pete Rust, Jessica Ericson, Bobby Duncan, and Shane Rewaldt. Thanks to Vaughn L. Paragamian, Charlie Holderman, Dmitri Vidergar, and Matt Davis for the reviewed drafts of this report. Finally, thanks to Vaughn L. Paragamian for continued guidance and Cheryl Leben for preparing the report for printing.

LITERATURE CITED

Ashley, K., L. Thompson, D. Sebastian, D. Lasenby, K. Smokorowski, and H. Andrusak. 1999. Restoration of kokanee salmon in Kootenay Lake, a large intermontane lake, by controlled seasonal addition of limiting nutrients. *In:* Aquatic Restoration in Canada. T. Murphy and M. Munawar, eds. Ecovision World Monograph Series. Backhuys Publishers, Leiden, The Netherlands.

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. IN: Fisheries Techniques. (Nielson, L. A., and D. L. Johnson, Eds.). pp. 283-300. Bethesda, Maryland: American Fisheries Society.

Blackwell, B. G., M. Brown, and D. Willis. 2000. Relative weight (Wr) status and current use in fisheries assessment and management. Reviews in Fisheries Science 8:1-44.

Bolger, T., and P. L. Connolly. 1989. The selection of suitable indices for the measurement and analysis of fish condition. Journal of Fish Biology 34:171-182.

Bonde, T. J., and R. M. Bush. 1975. Limnological investigations: Lake Koocanusa, Montana. Part one: Pre-impoundment Study, 1967-1972. U.S. Army Corps of Engineers, Special Report 82-21.

Cushman, R. M. 1985. Reviews of ecological effects of rapidly varying flows downstream from hydroelectric facilities. Transactions of the American Fisheries Society 5:330-339.

Downs, C. C. 2000. Kootenai River fisheries investigations: Rainbow trout recruitment. 1998 Annual report to Bonneville Power Administration. Project 88-65. Idaho Department of Fish and Game, Boise, Idaho.

Fredericks, J., J. Davis, N. Horner, and C. Corsi. 1997. Regional Fisheries Management Investigation, Panhandle Region (Subprojects I-A, II-A, III-A, IV-A). Federal Aid in Fish Restoration 1996 Job Performance Report. Idaho Department of Fish and Game, Boise, Idaho.

Hauer, F. R., and J. A. Stanford. 1997. Long-term influence of Libby Dam operation on ecology of macrozoobenthos of the Kootenai River, Montana and Idaho. Report to Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Hynes, H. B. N. 1970. The ecology of running waters. Pp 95-289. University of Toronto Press. Toronto, Ontario, Canada

Karr, J. R., K. D. Fausch, P. L. Angermeier, P. R. Yant, and I. J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Illinois Natural History Survey, Special Publication 5.

May, B., and J. E. Huston. 1983. Fisheries investigations July 1972-September 1983. Pages C1-C112 *in* Kootenai River fisheries investigations. Montana Department of Fish, Wildlife and Parks, Final Completion Report, Helena, Montana.

McArthur, T. 1992. Statewide angler opinion and harvest surveys, creel census system. Idaho Department of Fish and Game Job Completion Report, Project No. F71-R-14, Subproject I, Study I.

McGurk, M. D. 1985. Effects of net capture on the postpreservation morphometry, dry weight, and condition factor of Pacific herring larvae. Transactions of the American Fisheries Society 114:348-355.

Neumann, R. M., and B. R. Murphy. 1992. Seasonal relationships of relative weights to body composition in white crappie, *Pomoxis annularis* Rafinesque. Aquaculture and Fisheries Management 23:243-251.

Neumann, R. M., and D. W. Willis. 1995. Seasonal variations in gill-net sample indexes for northern pike collected from a glacial prairie lake. North American Journal of Fisheries Management 15:838-844.

Nielsen, L., and D. Johnson. 1985. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.

Northcote, T. C. 1973. Some impacts of man on Kootenay Lake and its salmonids. Great Lakes Fishery Commission, Technical Report TR-25, Ann Arbor, Michigan.

Paragamian, V. L. 1995. Kootenai River fisheries investigation: Stock status of burbot and rainbow trout and fisheries inventory. Idaho Department of Fish and Game, 1994 Annual Report to Bonneville Power Administration, Project 88-65, Boise, Idaho.

Paragamian, V. L. 2002. Changes in the species composition of the fish community in a reach of the Kootenai River, Idaho after construction of Libby Dam. Journal of Freshwater Ecology 17:375-383.

Parker, R. M., M. P. Zimmerman, and D. L. Ward. 1995. Variability in biological characteristics of northern squawfish in the lower Columbia and Snake Rivers. Transactions of the American Fisheries Society 124:335-346.

Partridge, F. 1983. Kootenai River Fisheries Investigations. Idaho Department of Fish and Game, Completion Report, Boise, Idaho.

Pieters, R., S. Harris, L. Thompson, L. Vidmanic, M. Roushorne, G. Lawrence, J. Stockner, H. Andrusak, K. Ashley, B. Lindsay, K. Hall, and D. Lombard. 2003. Restoration of kokanee salmon in the arrow lakes reservoir, British Columbia: preliminary results of a fertilization experiment. American Fisheries Society Symposium 34:177-196.

Richards, D. 1998. Kootenai River macro invertebrate study report. U.S. Department of Energy, Bonneville Power Administration, Environment, Fish and Wildlife, Portland, Oregon.

Rogers, K. B., L. C. Bergstedt, and E. P. Bergersen. 1996. Standard weight equation for mountain whitefish. North American Journal of Fisheries Management 16:207-209.

Royer, T. V., and G. W. Minshall. 1997. Development of an index for bioassessment of medium-sized rivers in Idaho and potential uses of ecosystem function in biomonitoring. Draft. Department of Biological Sciences, Idaho State University, Pocatello, Idaho.

Schill, D. J. 1991. Wild trout investigations. Idaho Department of Fish and Game. Job Performance Report. Project F-73-R-13, Job 1. Boise, Idaho.

Simpkins, D. G., and W. A. Hubert. 1996. Proposed revision of the standard-weight equation for rainbow trout. Journal of Freshwater Ecology 11:319-325.

Snyder, E. B., and G. W. Minshall. 1996. Ecosystem metabolism and nutrient dynamics in the Kootenai River in relation to impoundment and flow enhancement for fisheries management. Final Report. Stream Ecology Center, Idaho State University, Pocatello, Idaho.

Stevenson, R. J., C. G. Peterson, D. B. Kirschtel, C. G. King, and N. C. Tuchman. 1991. Density dependent growth, ecological strategies, and effects of nutrient and shading on benthic diatom succession in streams. Journal of Phycology 27:59-69.

Vannote, R. L., G. W. Minshall, and K. W. Cummins. 1980. The river continuum concept. Canadian Journal of Fisheries and Aquatic Science 37:130-137.

Walters, J. P. 2002. Kootenai River fisheries investigations: rainbow and bull trout recruitment. Annual progress report to Bonneville Power Administration, April 1, 2000-March 31, 2001. Project 1988-06500. Idaho Department of Fish and Game, Boise, Idaho.

Walters, J. P. In Review. Kootenai River fisheries investigations: rainbow and bull trout recruitment. Annual progress report to Bonneville Power Administration, April 1, 2001-March 31, 2002. Project 1988-06500. Idaho Department of Fish and Game, Boise, Idaho.

Wege, G. W., and R. O. Anderson. 1978. Relative weight (Wr): a new index of condition for largemouth bass. Pages 79-91 *In:* Novinger, G. D., and J. G. Dillard editors. New Approaches to the Management of Small Impoundments. North Central Division, American Fisheries Society, Special Publication No. 5, Bethesda, Maryland.

Woods, P. F. 1982. Annual nutrient loadings, primary productivity, and trophic state of Lake Koocanusa, Montana and British Columbia, 1972-80. Geological Survey Professional Paper 1283, United States Government Printing Office.

Zaroban, D. W., M. P. Mulvey, T. R. Maret, and G. D. Merritt. 1999. Classification of Species Attributes for Pacific Northwest Freshwater Fishes. Northwest Science 73:81-93.

APPENDICES

Appendix A. Mean seasonal zooplankton and rotifer densities in the Kootenai River at the Yaak River sample site in 2002 (rkm 283). June sampling was not performed at this site. SE = ± 1 standard error.

	July			August			September			October			November		
	Mean	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**
Crustacea species															
Alona costata	—	—	—	—	—	—	—	—	—	0.03	0.03	0.10	0.20	0.06	0.11
Bosmina longirostris	0.13	0.1	0.03	—	—	—	—	—	—	—	—	—	0.10	0.06	0.05
Calanoid copepodite	—	—	—	—	—	—	—	—	—	0.03	0.03	0.10	0.07	0.03	0.04
Chydorus sphaericus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cyclopoid copepodite	0.80	0.1	0.18	0.20	0.06	0.08	0.07	0.03	0.08	—	—	—	0.33	0.18	0.18
Cyclops bicuspidatus thomasi	0.40	0.1	0.09	0.07	0.03	0.03	0.03	0.03	0.04	—	—	—	0.33	0.09	0.18
Daphnia galeata mendotae	0.07	0.0	0.02	—	—	—	—	—	—	—	—	—	0.07	0.07	0.04
Leptodiaptomus tyrrelli	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nauplii	2.97	0.3	0.68	2.27	0.27	0.89	0.70	0.21	0.88	0.27	0.12	0.80	0.73	0.13	0.40
Rotifera species															
Ascomorpha ovalis	2.20	1.0	3	12.30	1.4	5	0.17	0.2	—	—	—	—	—	—	—
Asplanchna priodonta	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brachionus angularis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brachionus caudatus	—		—	—	—	—	—	—	—	—	—	—	—	—	—
Brachionus calyciflorus	0.63	0.4	1	—	0.0	—	—	—	—	—	—	—	—	—	—
Cephalodella spp.	—	—	—	—	0.0	—	0.30	0.3	—	0.07	0.1	—	—	—	—
Collotheca mutabilis	0.23	0.2	—	2.87	1.6	1	2.93	0.2	4	0.00	—	—	0.10	0.1	0
Colurella obtusa	—	—	—	0.70	0.7	—	—	—	—	0.20	—	1	0.33	0.2	1
Euchlanis parva	—	—	—	—	—	—	—	—	—	0.10	0.1	1	0.20	0.2	1
Euchlanis spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kellicottia longispina	7.03	1.0	9	8.13	0.7	3	0.93	0.3	1	0.63	0.3	4	1.30	1.3	5
Keratella cochlearis	31.63	2.1	39	100.7	8.7	42	38.00	2.3	53	7.77	0.8	50	11.60	3.6	44
Keratella longispina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Keratella quadrata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecane spp.	—	—	—	—	—	—	—	—	—	—	—	—	0.20	0.2	1
Lepadella patella	—	—	—	—	—	—	—	—	—	—	—	—	0.33	0.2	1
Monostyla closterocerca	—	—	—	—	—	—	—	—	—	—	—	—	0.27	0.3	1
Monostyla lunaris	—	—	—	—	—	—	—	—	—	0.07	0.1	—	—	—	—
Monostyla quadridentata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Monostyla spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Philodina sp.	—	—	—	0.77	0.8	—	—	—	—	—	—	—	—	—	—
Polyarthra major	0.30	0.3	—	0.87	0.4	—	0.13	0.1	—	—	—	—	—	—	—
Polyarthra remata	31.87	2.9	40	70.30	2.1	29	26.10	5.1	36	5.07	0.7	32	5.33	0.6	20

Appendix A. Continued.

	July			August			September			October			November		
	Mean	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**
Rotifera species, continued.															
Rotifera unidentified	6.07	0.5	8	14.77	2.8	6	3.47	0.7	5	1.60	0.5	10	6.73	1.1	26
Synchaeta spp.	0.33	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichocerca porcellus	0.17	0.2	—	16.23	8.1	7	—	—	—	0.07	0.1	—	—	—	—
Trichocerca pusilla	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichocerca rousseleti	—	—	—	13.97	12.6	6	0.30	0.2	—	—	—	—	—	—	—
Trichocerca uncinata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichotria tetractis	—	—	—	—	—	—	—	—	—	0.07	0.1	—	—	—	—

Appendix B. Mean seasonal zooplankton and rotifer densities in the Kootenai River at the Hemlock Bar sample site in 2002 (rkm 265). SE = ± 1 standard error.

	June			July			August			September			October			November		
	Mean	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**
Crustacea species																		
Alona costata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.30	—	16
Bosmina longirostris	0.13	0.1	1	—	—	—	1.17	1.1	35	—	—	—	—	—	—	0.13	0.1	7
Calanoid copepodite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.20	0.1	11
Chydorus sphaericus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cyclopoid copepodite	4.00	0.7	20	1.33	0.2	18	0.27	0.2	8	0.03	0.0	6	—	—	—	0.40	0.1	21
Cyclops bicuspidatus thomasi	0.73	0.4	4	0.20	0.1	3	0.03	—	1	—	—	—	—	—	—	0.03	—	2
Daphnia galeata mendotae	0.57	0.4	3	0.20	0.1	3	—	—	—	—	—	—	—	—	—	—	—	—
Leptodiaptomus tyrrelli	—	—	—	—	—	—	0.03	—	1	—	—	—	—	—	—	—	—	—
Nauplii	14.8	2.0	73	5.77	0.3	77	1.80	1.0	55	0.50	0.1	94	0.23	0.0	100	0.93	48	49
Rotifera species																		
Ascomorpha ovalis	9.03	3.0	22	5.97	0.7	6	15.17	5.0	7	0.17	0.2	—	—	—	—	—	—	—
Asplanchna priodonta	1.83	0.8	4	—	—	—	—	—	—			—	—	—	—	—	—	—
Brachionus angularis	—	—	—	—	—	—	—	—	—	0.33	0.3	1	—	—	—	—	—	—
Brachionus caudatus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brachionus calyciflorus	4.27	1.5	10	2.77	0.8	3	—	—	—	—	—	—	—	—	—	—	—	—
Cephalodella spp.	—	—	—	0.30	0.3	—	0.33	0.3	—	—	—	—	0.07	0.1	—	—	—	—
Collotheca mutabilis	4.40	1.7	11	0.20	0.2	—	9.67	1.4	4	15.97	15.2	27	—	—	—	0.23	0.2	1
Colurella obtusa	—	—	—	—	—	—	—	—	—	0.57	0.1	1	0.07	0.1	—	0.13	0.1	1
Euchlanis parva	—	—	—	—	—	—	—	—	—	—	—	—	0.07	0.1	—	1.10	0.6	6

Appendix B. Continued.

	June			July			August			September			October			November		
	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%
Rotifera species, continued.																		
Euchlanis spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kellicottia longispina	—	—	—	8.17	1.5	8	3.90	1.0	2	0.57	0.3	1	0.30	0.1	2	—	—	—
Keratella cochlearis	—	—	—	39.60	5.4	40	81.97	14.4	37	17.30	8.8	30	8.00	1.0	54	9.23	3.9	52
Keratella longispina	2.47	0.6	6	—	—	—	—	—	—	0.33	0.3	1	—	—	—	—	—	—
Keratella quadrata	—	—	—	—	—	—	—	—	—	—	—	—	0.10	0.1	1	—	—	—
Lecane spp.	0.23	0.2	1	—	—	—	—	—	—	—	—	—	—	—	—	0.13	0.1	1
Lepadella patella	0.30	0.3	1	—	—	—	—	—	—	—	—	—	0.10	0.1	1	0.13	0.1	1
Monostyla closterocerca	—	—	—	—	—	—	0.33	0.3	0	—	—	—	—	—	—	0.23	0.2	1
Monostyla lunaris	—	—	—	—	—	—	—	—	—	0.17	0.2	—	—	—	—	0.40	0.4	2
Monostyla quadridentata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Monostyla spp.	—	—	—	—	—	—	—	—	—	—	—	—	0.27	0.2	2	—	—	—
Philodina sp.	—	—	—	—	—	—	—	—	—	—	—	—	0.23	0.2	2	—	—	—
Polyarthra major	—	—	—	0.83	0.5	1	0.70	0.7	—	—	—	—	—	—	—	—	—	—
Polyarthra remata	13.03	1.7	31	33.20	8.6	34	72.43	4.2	33	18.87	3.6	32	4.47	0.8	30	3.43	0.9	19
Rotifera unidentified	5.57	1.5	13	5.57	1.5	6	9.80	2.0	4	3.70	1.5	6	0.97	0.5	7	2.40	0.2	13
Synchaeta spp.	—	—	—	0.17	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichocerca porcellus	0.30	0.3	1	1.07	0.8	1	28.33	0.7	13	0.10	0.1	—	0.07	0.1	—	—	—	—
Trichocerca pusilla	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichocerca rousseleti	—	—	—	—	—	—	—	—	—	—	—	—	0.17	0.1	1	—	—	—
Trichocerca uncinata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.40	0.4	2
Trichotria tetractis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Appendix C. Mean seasonal zooplankton and rotifer densities in the Kootenai River at the Cow Creek sample site in 2002 (rkm 251). SE = ± 1 standard error.

	June			July			August			September			October			November		
	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%	Mean	SE	%
Crustacea species																		
Alona costata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.33	0.1	11
Bosmina longirostris	1.23	0.3	7	0.13	0.1	2	—	—	—	—	—	—	—	—	—	0.07	0.1	2
Calanoid copepodite	—	—	—	—	—	—	—	—	—	—	—	—	0.03	—	25	0.33	0.1	11
Chydorus sphaericus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cyclopoid copepodite	2.30	0.6	12	0.77	0.2	11	0.10	—	3	—	—	—	—	—	—	0.33	0.2	11

Appendix C. Continued.

	June			July			August			September			October			November		
	Mean	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**	**Mean**	**SE**	**%**
Crustacea species, continued.																		
Cyclops bicuspidatus thomasi	0.67	0.1	4	0.37	0.1	5	0.07	0.0	2	—	—	—	—	—	—	0.47	0.3	15
Daphnia galeata mendotae	0.10	0.1	1	0.37	0.1	5	—	—	—	—	—	—	—	—	—	0.07	0.1	2
Leptodiaptomus tyrrelli	0.07	0.1	—	0.10	0.1	1	—	—	—	—	—	—	—	—	—	—	—	—
Nauplii	14.5	0.8	77	5.37	0.7	76	3.30	0.5	95	0.43	0.1	100	0.10	—	75	1.53	0.3	49
Rotifera species																		
Ascomorpha ovalis	4.30	1.4	12	5.53	1.1	6	9.00	1.9	4	0.17	0.2	—	—	—	—	—	—	—
Asplanchna priodonta	0.30	0.3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brachionus angularis	—	—	—	—	—	—	—	—	—	—	—	—	0.17	0.1	1	—	—	—
Brachionus caudatus	—	—	—	—	—	—	1.17	1.2	1	—	—	—	—	—	—	—	—	—
Brachionus calyciflorus	1.10	0.6	3	1.47	0.7	2	—	—	—	—	—	—	—	—	—	—	—	—
Cephalodella spp.	—	—	—	—	—	—	0.97	0.5	—	—	—	—	—	—	—	0.60	0.6	2
Collotheca mutabilis	4.33	0.3	12	—	—	—	1.60	0.8	1	1.80	0.7	3	0.30	0.2	2	0.40	0.4	2
Colurella obtusa	—	—	—	—	—	—	0.40	0.4	—	—	—	—	0.23	0.2	1	—	—	—
Euchlanis parva	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Euchlanis spp.	—	—	—	—	—	—	0.40	0.4	—	—	—	—	—	—	—	—	—	—
Kellicottia longispina	—	—	—	5.07	2.7	6	5.27	1.8	2	0.93	0.7	1	0.67	0.5	4	1.00	0.7	4
Keratella cochlearis	1.07	0.7	3	32.47	1.8	37	100.2	6.7	44	32.60	2.3	51	8.73	1.3	51	9.60	1.3	36
Keratella longispina	1.33	0.8	4	3.43	3.4	4	—	—	—	0.33	0.3	1	—	—	—	—	—	—
Keratella quadrata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecane spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lepadella patella	—	—	—	—	—	—	1.20	1.2	1	—	—	—	0.10	0.1	1	—	—	—
Monostyla closterocerca	—	—	—	—	—	—	1.73	1.7	1	—	—	—	—	—	—	—	—	—
Monostyla lunaris	0.40	0.4	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Monostyla quadridentata	—	—	—	0.30	0.3	—	—	—	—	—	—	—	0.10	0.1	1	—	—	—
Monostyla spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.40	1.1	5
Philodina sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Polyarthra major	—	—	—	—	—	—	1.73	1.7	1	0.30	0.3	—	—	—	—	—	—	—
Polyarthra remata	14.43	1.9	40	32.20	4.0	37	68.13	6.3	30	24.57	4.3	38	5.10	1.0	30	4.80	1.3	18
Rotifera unidentified	7.80	1.4	22	5.10	0.9	6	8.33	1.2	4	2.73	0.9	4	1.47	0.4	9	8.80	1.6	33
Synchaeta spp.	0.93	0.9	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichocerca porcellus	—	—	—	1.23	0.4	1	28.47	3.3	12	0.60	0.6	1	0.20	0.1	1	—	—	—
Trichocerca pusilla	—	—	—	—	—	—	—	—	—	0.33	0.3	1	—	—	—	—	—	—
Trichocerca rousseleti	—	—	—	0.23	0.2		0.40	0.4		0.17	0.2	—	0.10	0.1	1	—	—	—
Trichocerca uncinata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trichotria tetractis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Appendix D. 2003 summary of creel survey performed from Deep Creek to Idaho/Montana border.

Angler Summary Report
Idaho Department of Fish and Game
12/19/2003
Body of Water: Kootenai River **EPA Number: 1**

Angler Composition

Total Number of Anglers: 145
Percent of resident: 91.03%
Percent of nonresident: 11.03%

Total Number of Interviews: 70

Avg. Number Anglers/Interview: 2.07
Percentage of Interviews with:
1 angler: 40.00%
2 anglers: 35.71%
3 anglers: 11.43%
4 anglers: 7.14%
5 anglers: 1.43%
>5 anglers: 2.86%

Percentage of Anglers:

Catching:	Releasing:	Harvesting:
0: 49.66%	0: 63.45%	0: 78.62%
1: 15.17%	1: 13.10%	1: 11.72%
2: 13.10%	2: 4.14%	2: 6.90%
3: 4.83%	3: 2.07%	3: 1.38%
4: 2.07%	4: 2.07%	4: 0.00%
5: 0.00%	5: 0.00%	5: 0.00%
more than 6: 15.17%	more than 6: 15.17%	6: 1.38%

Type of Fishing (from Instantaneous Counts)

Boat: 53.67%
Bank: 45.87%
Tube: 0.46%
Ice: 0.00%

Method of Fishing

Bait: 50.30%
Lure: 17.12%
Fly: 32.58%

Catch Composition

RAINBOW: 11.90%	MWHTFISH: 16.67%
CUTTHROA: 0.00%	NPIKEMIN: 21.43%
KOKANEE: 2.38%	CUTXRAIN: 0.00%
SUCKER: 0.00%	PEAMOUTH: 47.62%
STURGEON: 0.00%	BURBOT: 0.00%
Y.PERCH: 0.00%	LMBASS: 0.00%
PUMPSD: 0.00%	BULLTR: 0.00%
BROOKTR: 0.00%	BROWNTR: 0.00%
OTHER: 0.00%	

Appendix D. Continued.

Number of Completed Trips: 24
Average Time Spent Fishing: 4.19 h

Management Questions

Total Number of Responses to Question 1: 53
Total Number of Responses to Question 2: 5

Percentage of Responses to Questions

Question 1	Question 2
0: 1.89%	1: 60.00%
1: 41.51%	4: 20.00%
2: 35.85%	0: 20.00%
4: 5.66%	
5: 1.89%	
10: 1.89%	
7: 1.89%	
3: 9.43%	

Appendix E. 2003 angler effort determined by creel survey from Deep Creek to Idaho/Montana border.

Section	Interval	Day type	Boat hours	Bank hours	Tube hours	Ice hours	Total (hrs)
1	2	Weekday	63	0	0	0	63
		Weekend	41	41	0	0	81
		Totals:	104	41	0	0	144
	+/-	95% CI:	136	81	0	0	158
1	3	Weekday	150	25	0	0	175
		Weekend	549	0	0	0	549
		Totals:	699	25	0	0	724
	+/-	95% CI:	1014	50	0	0	1015
1	4	Weekday	211	0	0	0	211
		Totals:	211	0	0	0	211
	+/-	95% CI:	282	0	0	0	282
1	6	Weekday	326	239	20	0	585
		Weekend	217	58	0	0	275
		Totals:	543	297	20	0	860
	+/-	95% CI:	404	245	40	0	474
1	7	Weekday	263	35	0	0	298
		Weekend	210	34	0	0	244
		Totals:	473	69	0	0	542
	+/-	95% CI:	438	83	0	0	446
1	8	Weekend	9	9	0	0	18
		Totals:	9	9	0	0	18
	+/-	95% CI:	18	18	0	0	25

Appendix E. Continued.

Section	Interval	Day type	Boat hours	Bank hours	Tube hours	Ice hours	Total (hrs)
1	9	Weekend	10	0	0	0	10
		Totals:	10	0	0	0	10
	+/-	95% CI:	20	0	0	0	20
1	12	Weekday	33	0	0	0	33
		Weekend	100	75	0	0	175
		Totals:	133	75	0	0	208
	+/-	95% CI:	124	150	0	0	195
	Section 1	**Totals:**	**2182**	**516**	**20**	**0**	**2717**
	+/-	**95% CI:**	**1223**	**314**	**40**	**0**	**1264**
2	1	Weekday	84	294	0	0	378
		Weekend	36	288	0	0	324
		Totals:	120	582	0	0	702
	+/-	95% CI:	128	455	0	0	473
2	2	Weekday	63	347	0	0	410
		Weekend	20	223	0	0	243
		Totals:	83	570	0	0	653
	+/-	95% CI:	93	548	0	0	556
2	3	Weekend	70	70	0	0	140
		Totals:	70	70	0	0	140
	+/-	95% CI:	75	139	0	0	158
2	4	Weekday	141	0	0	0	141
		Weekend	73	0	0	0	73
		Totals:	214	0	0	0	214
	+/-	95% CI:	138	0	0	0	138
2	6	Weekday	300	19	0	0	319
		Weekend	189	15	0	0	203
		Totals:	489	34	0	0	522
	+/-	95% CI:	376	47	0	0	379
2	7	Weekday	124	31	0	0	154
		Weekend	90	34	0	0	124
		Totals:	214	65	0	0	278
	+/-	95% CI:	122	91	0	0	152
2	8	Weekday	43	0	0	0	43
		Weekend	17	17	0	0	33
		Totals:	60	17	0	0	76
	+/-	95% CI:	67	33	0	0	74
2	9	Weekday	14	0	0	0	14
		Weekend	41	0	0	0	41
		Totals:	55	0	0	0	55
	+/-	95% CI:	51	0	0	0	51

Appendix E. Continued.

Section	Interval	Day type	Boat hours	Bank hours	Tube hours	Ice hours	Total (hrs)
2	12	Weekday	17	100	0	0	117
		Weekend	0	75	0	0	75
		Totals:	17	175	0	0	192
	+/-	95% CI:	33	133	0	0	137
2	13	Weekday	13	50	0	0	63
		Totals:	13	50	0	0	63
	+/-	95% CI:	25	100	0	0	103
	Section 2	**Totals:**	**1335**	**1563**	**0**	**0**	**2895**
	+/-	**95% CI:**	**464**	**752**	**0**	**0**	**884**
	Season	**Totals:**	**3517**	**2079**	**20**	**0**	**5612**
	+/-	**95% CI:**	**1308**	**815**	**40**	**0**	**1542**

Appendix F. 2003 angler harvest from Deep Creek to Idaho/Montana border. For fish abbreviations see Table 18.

Section	Interval	Day type	Fish kept	Fish released	Fish caught	Species Harvested RBT	MWF	WCT	NPM	KOK	WCTxRBT	LSS	PMC
1	1	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total:	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	2	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	3	1	70	70	140	0	70	0	0	0	0	0	0
		2	92	183	275	46	0	0	46	0	0	0	0
		Total	162	253	415	46	70	0	46	0	0	0	0
+/-	95%	CI:	250	342	679	102	143	0	102	0	0	0	0
1	4	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	5	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	6	1	20	278	297	20	0	0	0	0	0	0	0
		2	10	212	222	5	5	0	0	0	0	0	0
		Total	30	490	519	25	5	0	0	0	0	0	0
+/-	95%	CI:	34	251	451	32	13	0	0	0	0	0	0
1	7	1	0	80	80	0	0	0	0	0	0	0	0
		2	14	108	122	7	0	0	0	7	0	0	0
		Total	14	188	202	7	0	0	0	7	0	0	0
+/-	95%	CI:	39	146	233	19	0	0	0	19	0	0	0

Appendix F. Continued.

Section	Interval	Day type	Fish kept	Fish released	Fish caught	Species Harvested RBT	MWF	WCT	NPM	KOK	WCTxRBT	LSS	PMC
1	8	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	9	9	0	0	0	0	0	0	0	0
		Total	0	9	9	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	13	22	0	0	0	0	0	0	0	0
1	9	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	10	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	11	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
1	12	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	111	111	0	0	0	0	0	0	0	0
		Total	0	111	111	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	120	139	0	0	0	0	0	0	0	0
1	13	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
	Sec 1	**Total**	**206**	**1051**	**1256**	**78**	**75**	**0**	**46**	**7**	**0**	**0**	**0**
+/-	**95%**	**CI:**	**256**	**464**	**859**	**109**	**144**	**0**	**102**	**19**	**0**	**0**	**0**

Appendix F. Continued.

						Species Harvested							
Section	Interval	Day type	Fish kept	Fish released	Fish caught	RBT	MWF	WCT	NPM	KOK	WCTxRBT	LSS	PMC
2	1	1	18	70	88	0	18	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	18	70	88	0	18	0	0	0	0	0	0
+/-	95%	CI:	52	64	172	0	52	0	0	0	0	0	0
2	2	1	34	50	84	17	17	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	34	50	84	17	17	0	0	0	0	0	0
+/-	95%	CI:	39	47	112	37	28	0	0	0	0	0	0
2	3	1	0	0	0	0	0	0	0	0	0	0	0
		2	93	0	93	0	93	0	0	0	0	0	0
		Total	93	0	93	0	93	0	0	0	0	0	0
+/-	95%	CI:	113	0	113	0	113	0	0	0	0	0	0
2	4	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
2	5	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
2	6	1	0	479	479	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	479	479	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	499	782	0	0	0	0	0	0	0	0
2	7	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0

Appendix F. Continued.

						Species Harvested							
Section	Interval	Day type	Fish kept	Fish released	Fish caught	RBT	MWF	WCT	NPM	KOK	WCTxRBT	LSS	PMC
2	8	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	6	6	0	0	0	0	0	0	0	0
		Total	0	6	6	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	7	7	0	0	0	0	0	0	0	0
2	9	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
2	10	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
2	11	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
2	12	1	0	195	195	0	0	0	0	0	0	0	0
		2	210	60	270	0	0	0	60	0	0	0	150
		Total	210	255	465	0	0	0	60	0	0	0	150
+/-	95%	CI:	296	180	541	0	0	0	85	0	0	0	212
2	13	1	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
+/-	95%	CI:	0	0	0	0	0	0	0	0	0	0	0
	Sec 2	**Total**	**355**	**860**	**1215**	**17**	**128**	**0**	**60**	**0**	**0**	**0**	**150**
+/-	**95%**	**CI:**	**324**	**536**	**979**	**37**	**128**	**0**	**85**	**0**	**0**	**0**	**212**
	Season	**Total**	**561**	**1911**	**2471**	**95**	**203**	**0**	**106**	**7**	**0**	**0**	**150**
+/-	**95%**	**CI:**	**413**	**709**	**1303**	**115**	**193**	**0**	**133**	**19**	**0**	**0**	**212**

Appendix G. Catch (C) and harvest (H) rates (number of fish/h) for anglers fishing the Kootenai River Idaho from rkm 240.5 (Deep Creek) to rkm 275.5 (Montana state line) between March 1 and November 25, 2002. For fish abbreviations see Table 18.

			RBT		MWF		WCT		NPM		KOK		LSS		PMC	
Section	**Interval**	**Day type**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**
1	1	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	2	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	3	Weekday	0	0.4	0.4	0.4	0	0	0	0	0	0	0	0	0	0
		Weekend	0.08	0.08	0	0	0	0.25	0.08	0.08	0	0	0	0	0	0
1	4	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	5	Weekday	0	3	0	0	0	0	0	2	0	0	0	0	0	1
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	6	Weekday	0.03	0.34	0	0.1	0	0.03	0	0.03	0	0	0	0	0	0
		Weekend	0.02	0.42	0.02	0.04	0	0.11	0	0.21	0	0	0	0.04	0	0
1	7	Weekday	0	0.04	0	0.04	0	0.19	0	0	0	0	0	0	0	0
		Weekend	0.03	0.41	0	0	0	0	0	0	0.03	0.06	0	0	0	0
1	8	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
1	9	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	12	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0.63	0	0	0	0	0	0	0	0	0	0
1		Weekday Avg.	0	0.29	0.03	0.04	0	0.02	0	0.16	0	0	0	0	0	0.08
1		Weekend Avg.	0.01	0.11	0	0.05	0	0.03	0.01	0.03	0	0	0	0	0	0
1		Season Avg.	0	0.23	0.02	0.04	0	0.02	0	0.12	0	0	0	0	0	0.05
2	1	Weekday	0	0.09	0.05	0.05	0	0	0	0.09	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	Weekday	0.04	0.04	0.04	0.04	0	0	0	0.08	0	0	0	0	0	0.04
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	3	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0.67	0.67	0	0	0	0	0	0	0	0	0	0
2	4	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix G. Continued.

			RBT		MWF		WCT		NPM		KOK		LSS		PMTH	
Section	**Interval**	**Day type**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**	**H**	**C**
2	5	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	Weekday	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	7	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	8	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0
2	9	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	10	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	11	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	12	Weekday	0	0	0	0	0	0	0	0.67	0	0	0	0.33	0	0.67
		Weekend	0	0.6	0	0	0	0	0.8	0.9	0	0	0	0.1	2	2
2	13	Weekday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Weekend	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1&2		Weekday Avg.	0	0.01	0.01	0.05	0	0	0	0.06	0	0	0	0.03	0	0.13
		Weekend Avg.	0	0.05	0.05	0.06	0	0	0.06	0.07	0	0	0	0.01	0.15	0.15
		Season Avg.	0	0.02	0.02	0.05	0	0	0.02	0.07	0	0	0	0.02	0.04	0.13
		Comb Weekday Avg.	**0**	**0.15**	**0.02**	**0.04**	**0**	**0.01**	**0**	**0.11**	**0**	**0**	**0**	**0.01**	**0**	**0.1**
		Comb Weekend Avg.	**0.01**	**0.08**	**0.03**	**0.06**	**0**	**0.01**	**0.03**	**0.04**	**0**	**0**	**0**	**0.01**	**0.08**	**0.08**
		Comb Season Avg.	**0**	**0.13**	**0.02**	**0.05**	**0**	**0.01**	**0.01**	**0.09**	**0**	**0**	**0**	**0.01**	**0.02**	**0.09**

Prepared by:

Ryan S. Hardy
Fishery Research Biologist

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Virgil K. Moore, Chief
Bureau of Fisheries

Daniel J. Schill
Fisheries Research Manager